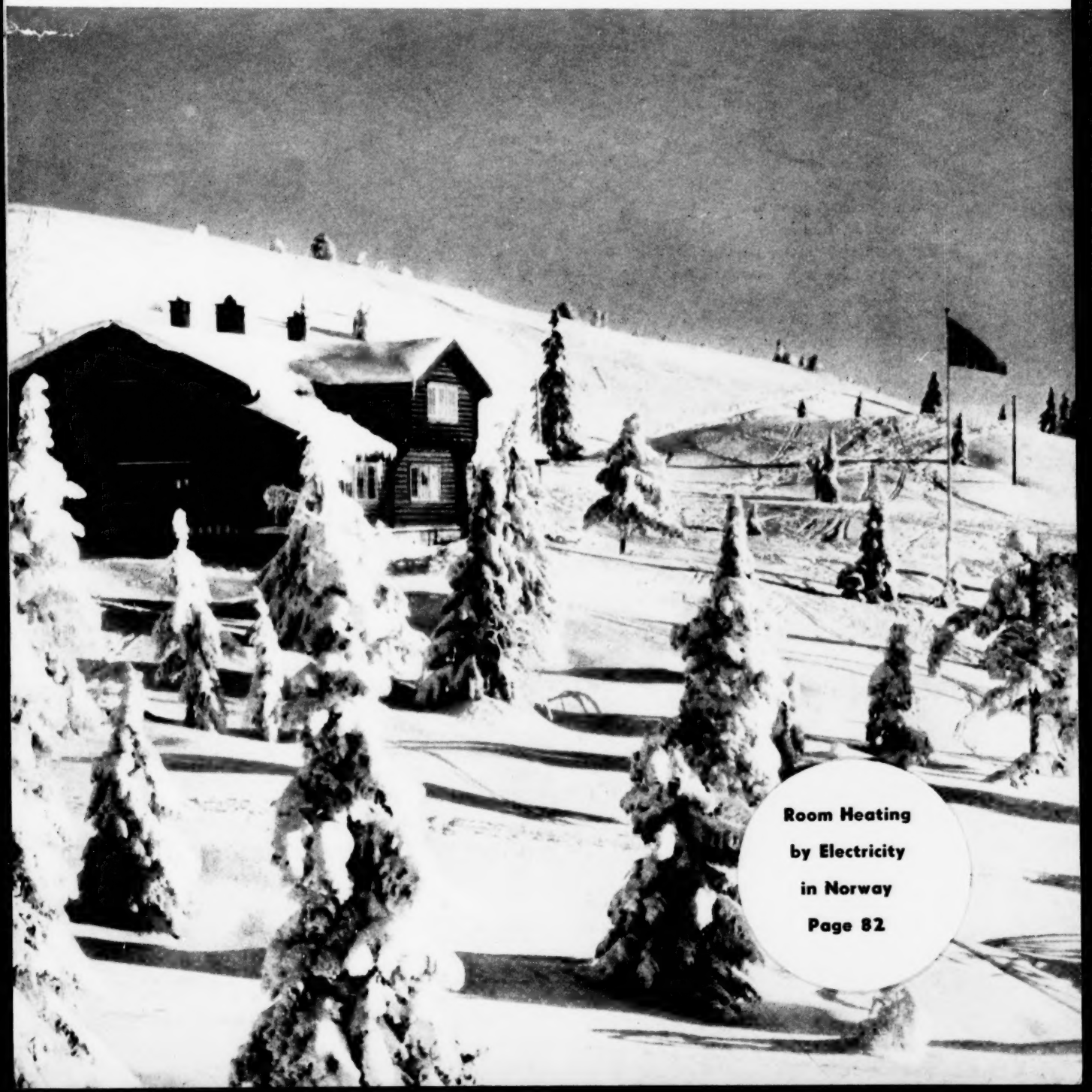
JUNE, 1953

HEATING AND VENTILATING

INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION



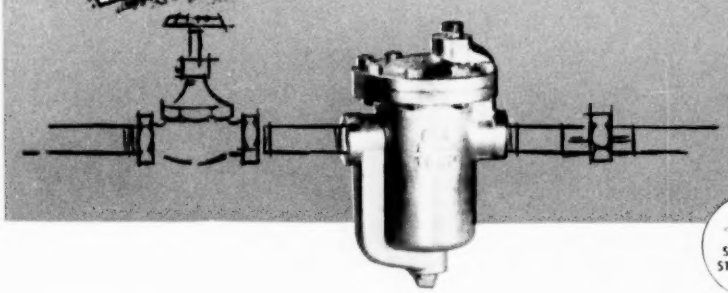
Room Heating by Electricity in Norway

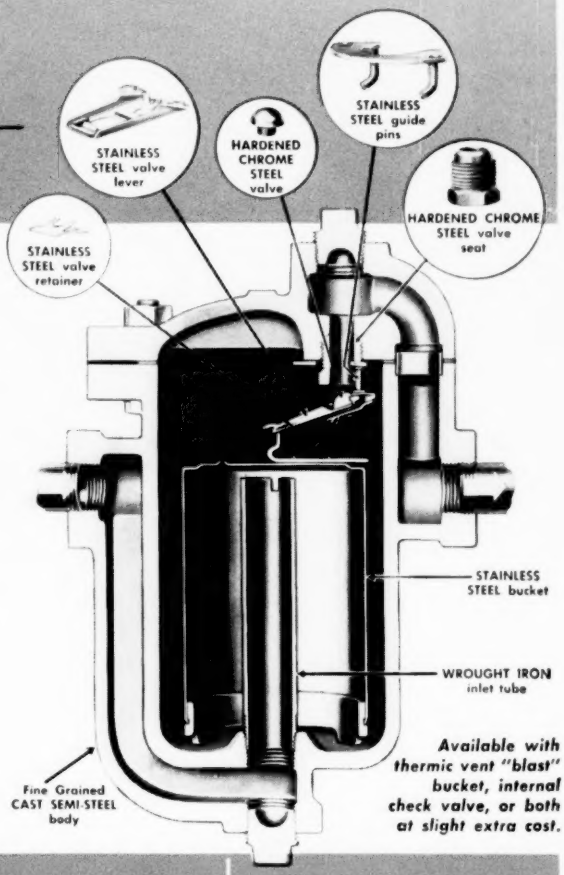
Page 82

NEW

ARMSTRONG No. 814

. . . a side inlet-side outlet steam trap with 1" or 1¼" pipe connections!




STAINLESS STEEL valve lever
HARDENED CHROME STEEL valve
STAINLESS STEEL guide pins
HARDENED CHROME STEEL valve seat
STAINLESS STEEL valve retainer
STAINLESS STEEL bucket
WROUGHT IRON inlet tube
Fine Grained CAST SEMI-STEEL body

Available with thermic vent "blast" bucket, internal check valve, or both at slight extra cost.

NOW, with the addition of the No. 814, you have a choice of five sizes of Armstrong side inlet-side outlet traps from ½" to 1¼" for use wherever horizontal and opposite pipe connections will make the simplest hookups. Bottom inlet-top outlet traps are available in the same size range, so that for the majority of all condensate loads you can use the body style that best suits the job.

Capacity of the new No. 814 is 6500 lbs./hr. at 125 psig.; height 13⅝"; face to face dimension 8"; weight 45 lbs.; price $46.00 list.

For complete data on the No. 814 and other Armstrong traps, call your Armstrong Representative or mail the coupon today.

ARMSTRONG MACHINE WORKS
846 Maple St., Three Rivers, Mich.

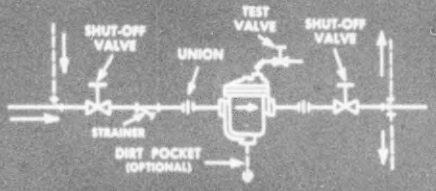


FIG. 1. Standard hookup for side inlet-side outlet traps.

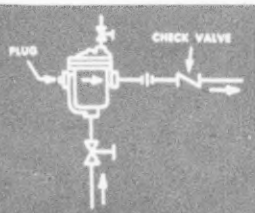


FIG. 2. Alternate hookup with inlet at bottom.

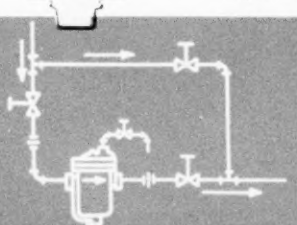


FIG. 3. Bypass hookup for side inlet-side outlet traps.

HOW TO ORDER:

Refer to Armstrong Catalog J, Sweets' Plant Engineering or Industrial Construction Files or Chemical Engineering Catalog. Capacities of the 814 are identical to the 214 trap listed in these Catalogs. Other data are given above. Specify trap number, pipe connections and maximum operating pressure.

ARMSTRONG MACHINE WORKS
846 Maple St., Three Rivers, Mich.

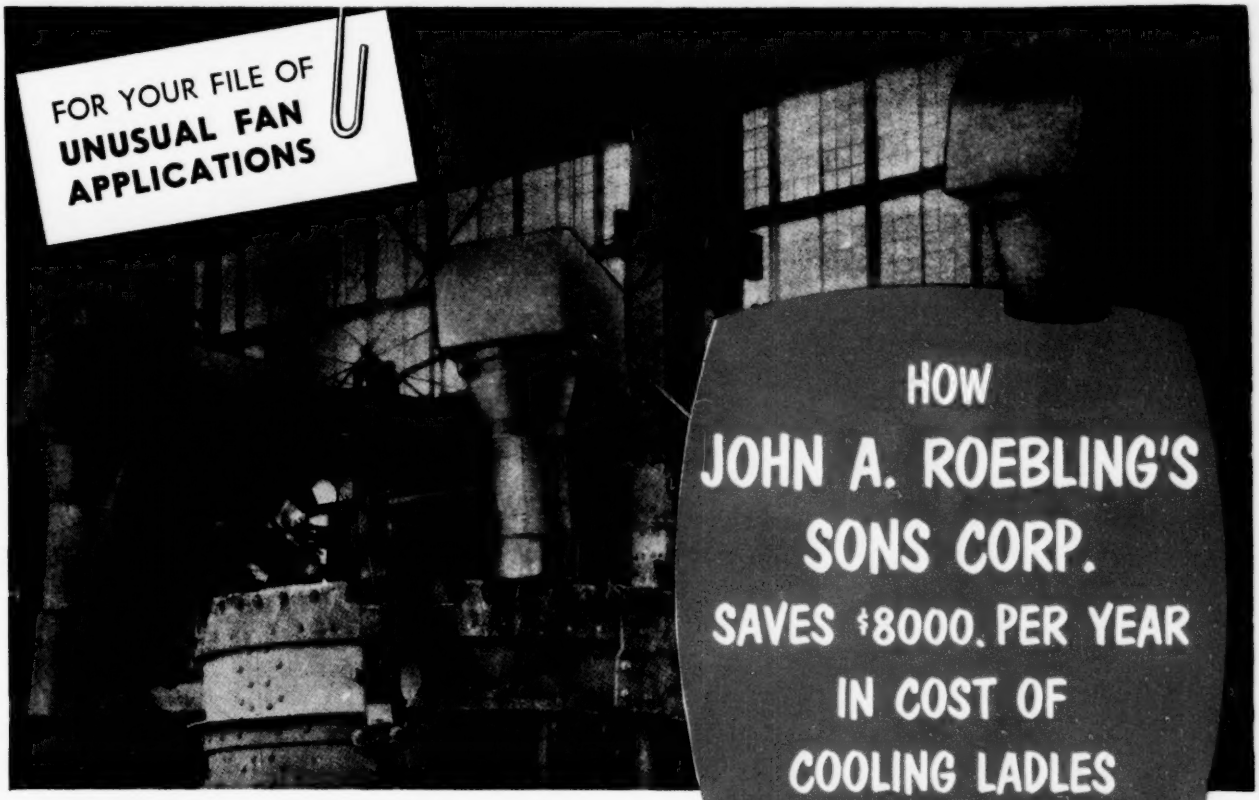
- ☐ Send complete data on No. 814 trap.
- ☐ Send Catalog J listing all Armstrong traps.
- ☐ Have Representative call.

Name_____

Company_____

Street Address_____

City_____ Zone____ State_____



HOW JOHN A. ROEBLING'S SONS CORP. SAVES $8000. PER YEAR IN COST OF COOLING LADLES

At the Roebling, New Jersey, mill of John A. Roebling's Sons Corporation, seventeen 45-ton ladles are kept busy in the production of carbon steel, from which the famous Roebling wire rope is made. After each heat, ladles must be cooled down from 2000° F and pouring nozzles installed.

Dissatisfied with the old method of using compressed air for cooling ladles, engineers at Roebling's conceived the idea of trying a DeBothezat "Hy-V" Air Jet to do the job. They selected a "Hy-V" Air Jet with 21" fan wheel and 1½ HP motor which produces 5600 CFM at a nozzle velocity of 4570 FPM, and it worked so well that Roebling has installed four more. Each is mounted on a swinging bracket and is equipped with special nozzle extension so that air is discharged near the bottom of the ladle. Nozzle extension is retractable.

Here's what E. M. Yard, Roebling Combustion Engineer, has to say about the installation: *"Nearly the full capacity of one 200 HP air compressor was previously used to do this job. The use of "Hy-V" Air Jets means a power saving of probably $8,000.00 per year. In addition, the installation of these fan units, at a total cost of about $4,000.00 eliminated the need for additional air compressor capacity which would have cost $16,000.00. These fan units will recover their cost in about six months from power savings alone."*

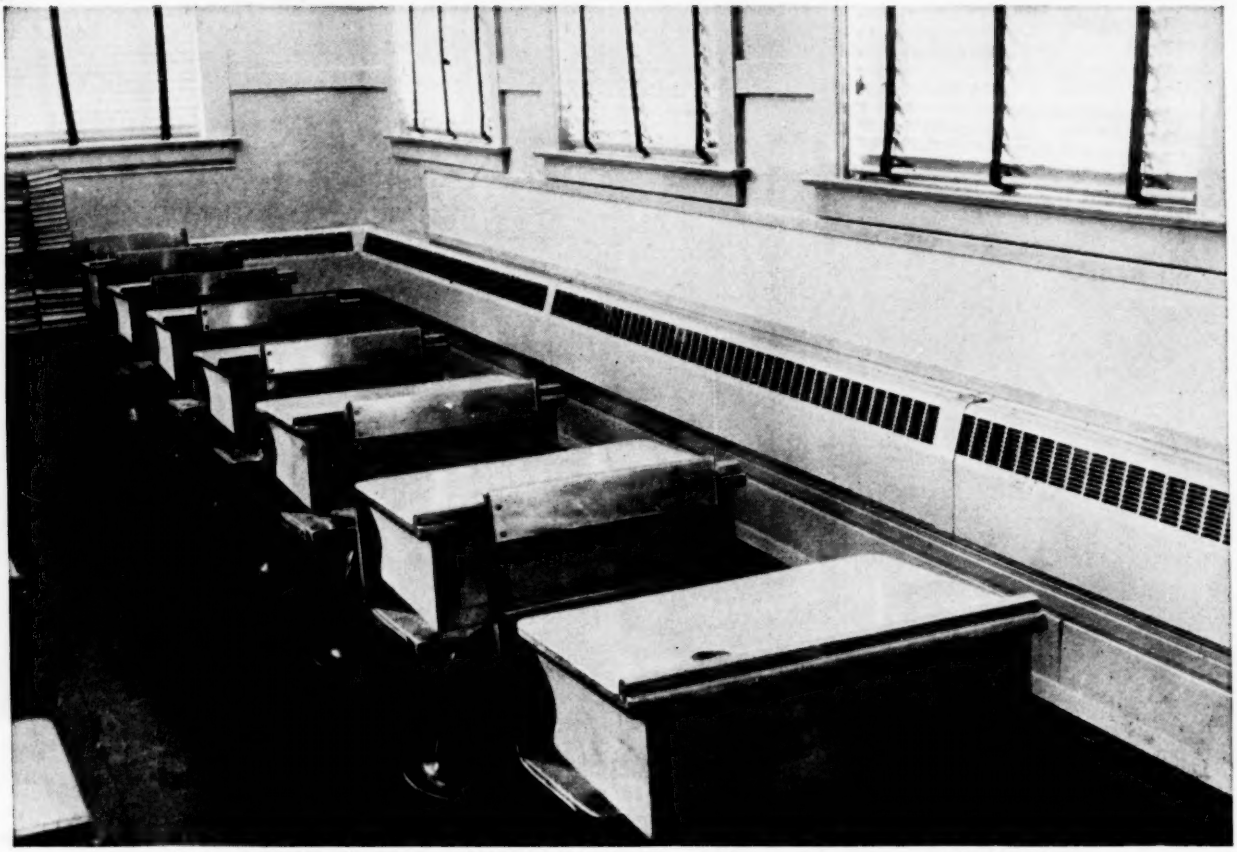
Whether it's a question of cooling people or equipment, "Hy-V" Air Jets do the job efficiently and inexpensively. For detailed information, ask your DeBothezat representative or write our factory, Dept. HV653, for catalog DH-8-51

Certified Ratings
PAMA

"HY-V" AIR JET
is a 14-blade axial-flow pressure fan which projects a high velocity stream of air as far as 65 feet. Built with fan wheels 18" through 30" in diameter, with nozzle velocities up to 5780 FPM.

DeBothezat Fans

Division of American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS



Webster Walvector with attractive cabinet-type enclosure adds a modern touch in classrooms of Garfield School.

New School Building from Old

Maywood, Ill. . . . Public school officials here have extended the usefulness of the old section of the 53-year-old Garfield School by comprehensive modernization. Outstanding feature was replacement of obsolete hot air system with Webster Walvector.

Rejuvenation of the old section of the Garfield School in 1951 involved such things as fresh, light-colored paint, sanitary asphalt floor tiles and modern, movable desks. These improvements would not have been long lasting with the obsolete duct-type hot air system. Hence, Webster Tru-Perimeter Heating and Webster Walvector were vital to the plan.

Here's what Joseph Lorenzo, Building Superintendent, has to say: "We like the new system very much. Heat is spread evenly along outside walls and under all the windows with a minimum of piping. It is much more economical than our old system." Webster Walvector stops down-drafts, provides gentle heat to all parts of the room, eliminates cold and hot spots.

The new heating installation has five zones. Webster Walvector was installed in all ten classrooms. Webster Convector Radiators were used in vestibules, corridors and all other rooms.

Interested in full details about Webster Walvector? Ask your local Webster Representative for Bulletin B-1551 or write us.

Garfield School, Maywood Ill. Old section, built about 1900, was completely rejuvenated in 1951. Heating installation by Tropt Heating & Ventilating Co., Inc., with the approval of Chiaro & Chiaro, Architects and Engineers, school architects.

Address Dept. HV-6

WARREN WEBSTER & COMPANY
Camden 5, N. J. Representatives in Principal U. S. Cities
In Canada, Darling Brothers, Limited, Montreal

Webster WALVECTOR
REG. U. S. PAT. OFF.
For Steam or Hot Water Heating

HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

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The Industrial Press

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and technical books.

THIS MONTH'S COVER

The cover photograph, showing a picturesque winter scene in Norway, is published through the courtesy of the Norwegian Information Service, New York, N. Y. For an article on room heating by electricity in Norway, see page 82.

Washington News

LORING F. OVERMAN

WASHINGTON, too, has its "DP's" — several thousands of government employees displaced by the GOP tide. Their problems are very real, and their complaints are highly vocal. If one were to accept their viewpoints, it would be difficult to reach any conclusion other than that the country is headed straight for the ditch.

They, as well as other Washington critics, observe that:

The budget hasn't been balanced,

Taxes haven't been cut,

Defense budgets have been trimmed, perhaps to dangerous levels,

After 120 days of trial and error, they point out, the new Administration is still only trying to find a solution.

Jockeying For Position

There can be no question that the political field, as it sweeps around the first turn and heads for the mid-year backstretch, has been doing some careful jockeying for position. There have been many differences of opinion within the field, but that is what makes horse races. It is becoming apparent that the Individual Enterprise stables are taking over; that the Controlled Economy runners are losing ground, and that the nation is soon to witness a stretch battle which may prove for all time whether the voters prefer their races freely run or "hippodromed."

In all fairness to those who like the latter type, it must be said that such races appear mighty exciting. The hippodromed race is the controlled race. You see it at the circus when two or more sets of four-horse chariots race at breakneck speed on a narrow oval. Just as the speedsters enter the turn, the chariot on the inside swings to the outside, allowing the rival racer to take the inside lane and go into the lead. On the next turn the process is reversed, and the predetermined winner always crosses the line on time, much to the enjoyment of the spectators.

In the current Washington contest there is no hippodroming. A new set of folks are on the track. Until they cross the finish line, it's anybody's race.

May Report "Fair"

The May report to the President, submitted by the Office of the Economic Adviser, indicates that industrial production continued in April at the post-World War II record of March. The possibility that a plateau has been reached is suggested by the fact that the April output index, for the first time in eight months, failed to show an increase. Similarly, employment in the nation during April was at a new peak for the month, but the change from March was largely seasonal. The same situation existed for most other keys to business activity.

The only important decline noted in April was in construction. The dollar value of April building, after seasonal adjustment, was 2% under March. Although that was the first such decrease from a previous month since last August, the April construction total was still considerably above the same month of 1952.

'53 Total $33.5 Billion

Despite some changes in the demand picture, NPA projections through March indicated that the official construction total for 1953 would be $33.5 billion—the seventh consecutive all-time high. It was indicated that such records would then end, with a downturn possible. The April pause may mean a cutback in the 1953 projections, but for the moment they are considered logical.

The 1953 rise in construction to date is apparently due to the increased availability of materials, and to the removal of credit controls. Private home building was 12½% higher in the first quarter of 1953 than in the third quarter of 1952. Commercial construction jumped 47% between the same comparative periods. Both increases are presumed to be about over, but are expected to remain above 1952 third quarter levels throughout the year. Home building is expected to reach $11.5 billion this year, an increase of $400 million over 1952.

Several types of construction of particular interest to the heating, ventilating, air-conditioning and piping industries are in the groups slated for further increases. Educational building construction, for example, shows no sign of decline this year, if figured from the standpoint of increasing need. Only financing problems have held the total down to present levels. Enrollment peaks have been about reached, however, and next year may see classroom space abreast of needs.

Hospital and institutional types of public construction are also reported as over the top. The Veterans' hospital program is nearing completion, and after this fiscal year, a reduction in Federal aids to state and local hospitals is likely.

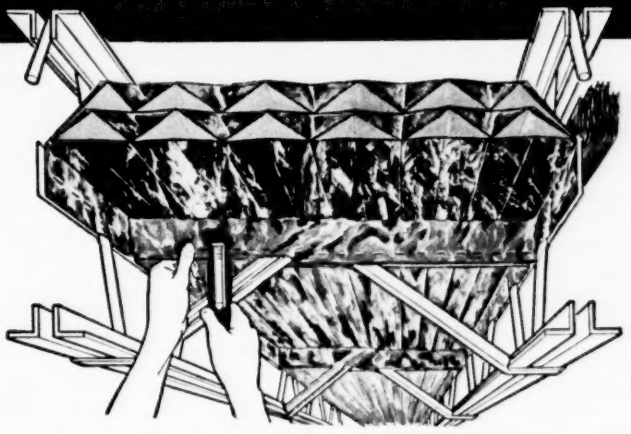
"Mobilization Readiness" Policy

Newest shift in the mobilization base idea is a "mobilization readiness policy," announced in a preliminary way in mid-May. Objective of the new policy is to achieve the maximum amount of readiness possible with available fiscal and economic resources. The readiness policy again turns attention upon the possibility that defense is to be more than a mobilization. Instead, the goal of the readiness policy will be to build the defense program to a "strength plateau," to be maintained indefinitely.

Holding the nation's economy on such a production level may prove to be the most difficult of assignments, for this country has not been accustomed to the idea of maintaining a strong military machine year in and year out.

The assignment is to be entrusted to a new Office of Defense Department is sponsoring the cut-cross-hauling gency planning under one roof and one agency. The new ODM will occupy the old State Department building in Washington. Oddly enough, this was the headquarters of the National Security Resources Board, which was supposed to have all military planning under control at the time of the Korean outbreak. Unfortunately, the organization and its objectives were largely "on paper," and

for Steel Beam and Truss Problems of Heat Loss, Heat Intrusion & Condensation



Costs 16¢ sq. ft., material with labor!

In Factories, Warehouses, Residences, Stores, Hospitals, Theatres, Markets, Arenas, Schools, Hangars, Gymnasiums

It is hard to keep these buildings warm in winter and cool in summer. Condensation sometimes forms, drips, causes damage. The problem is often solved by insulating with three tough, never-touching sheets of aluminum compartmented by two fiber partitions.

Steel beams are good conductors, extract much heat from the surrounding atmosphere, which causes a dew-point to be reached with resulting condensation. They need insulation against heat and vapor flow. Multiple accordion aluminum sheets are virtually non-condensation-forming, retain no moisture, have zero vapor permeability. Their heat emissivity on the cold side is 3%.

Contrast this with the necessity of heating-up tons of steel beams and ordinary insulation, sometimes wet, which wastefully radiate heat at a 90% rate on the cold side. In summer, iron and steel beams, ordinary insulations, and most building materials, often continue to radiate uncomfortable heat into a room long after the outside air has cooled.

Multiple accordion aluminum sheets are not only cooler at night, but through the hot summer day maintain temperatures which are sometimes 10 degrees to 20 degrees cooler than the shade outside.

A new form of pre-fabricated multiple accordion, very tough, aluminum insulation for steel beams and trusses is available as Infra 6HW, 1½" wider than standard, and heavier. A type 4HW, with 4 reflective spaces instead of 6, is also available.

The general question of preventing unwanted heat and vapor flow is authoritatively and interestingly discussed in Schwartz's "Simplified Physics of Vapor and Thermal Insulation." Steel and beam problems are included. For samples of the new insulation and copies of the manual, use the coupon.

Infra Insulation, Inc., 525 Broadway, New York, N. Y.
Telephone WOrth 4-2241

INFRA TYPE 6HW

Thermal Factors

Up-Heat	**C.089, R 11.23**	**= 4 3/5" dry rockwool**
Wall-Heat	**C.073, R 13.69**	**= 5 5/8" dry rockwool**
Down-Heat	**C.044, R 22.72**	**= 9" dry rockwool**

Exposed Aluminum .002" Thick
Bursting Strength 52 lbs. (Mullen Test)
Tearing Strength 80 grams (Elmendorf Test)

INFRA INSULATION, INC.
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Please send FREE "Simplified Physics of Vapor and Thermal Insulation."

Name_____

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☐ Send Prices ☐ Send Infra 6HW Sample

months followed Korea before NSRB plans actually became effective. Idea of the new ODM is to have all defense projects on the readiness plateau, instead of on paper.

The new ODM setup was outlined in the President's Reorganization Plan No. 3, sent to Congress on April 2. The plan will automatically become legal in mid-June unless Congress votes otherwise. Such action is not anticipated. Under the plan, ODM becomes a permanent and statutory agency. It takes over the planning functions of NSRB, and the stockpiling duties of the Munitions Board, both of which offices are abolished by the reorganization plan.

Six assistant directors will head an equal number of divisions under Director Arthur S. Fleming. Their functions:

Requirements and production—to coordinate studies on requirements for full mobilization; to plan expansion goals for defense-supporting and civilian industries, including machine tools, electric power, petroleum and transportation; to expedite defense programs; to control the defense materials system and any other distribution controls.

To take over the stockpile program and handle expansion programs on raw materials.

To direct financial defense policy, through tax amortization, loan guarantees, direct defense loans, and subsidies, if authorized, for marginal producers of critical materials.

To plan for governmental and industrial operation in the event of enemy attack.

To assume highest level responsibility on industrial training and draft deferment.

To plan economic stabilization programs, such as wage-price-rent control and rationing.

Despite its broad assignments, the new ODM does not plan to become another sprawling bureaucracy. Instead it is expected to function through old line agencies and industry advisory committees.

Economy Controls

In place of the economic controls favored by some legislators, the present crew of defense planners is experimenting with economy controls. Among ideas advanced are the following:

To reduce or eliminate unnecessary cross-hauling. The Defense Department is sponsoring the cut-cross-hauling program, specified in an eight-point directive issued by Kenneth L. Vore, Defense Department Director of Transportation. The Service Secretaries are directed to make necessary changes in the regulations and procedures within 30 days.

To aid procurement of long lead-time spare parts needed by the Air Force, a new procedure now being tested (1) authorizes an aircraft contractor to make his own determination of just what spare parts will be needed to supplement the planes he is producing, (2) permits the contractor to begin construction of the spares at the time the planes are started and (3) authorizes this go-ahead on spares prior to review and approval by the Air Force.

To squeeze all possible water out of the defense program. Because of advance commitments and the need to bring the defense machine up to a predetermined strength, the economy-minded have found it difficult to trim the defense budget. Current recommendation is that $5.1 billion be trimmed from the $41.3 billion defense budget recommended by Mr. Truman. Such a program would give the Office of the Secretary of Defense approximately $1 billion in new funds; Department of the Army, $13.6 billion; Department of the Navy, $9.6 billion, and Department of the Air Force, $11.7 billion. Including unexpended funds totaling about $63 billion on June 30, 1953, the new appropriation would make $99 billion available for the Department of Defense in the coming fiscal year.

"A substantial reduction is hoped for in the fiscal year 1954 as compared with the $43.4 billion in the Truman budget," said Rep. Richard Wigglesworth (R-Mass.), chairman of the House Armed Services Appropriations Subcommittee. "It is believed that the present military power can be greatly increased with less money. The world situation demands not only a powerful national defense, but a strong national economy."

Economy Need Obvious

Evidence that there is ample need for economy in government was read into the Congressional Record by Representative Fred E. Busbey (R-Ill.). He pointed out that federal, state, and local taxes now absorb 30.03% of the national income, which is at a rate of $304.3 billion a year. He called for cuts in both taxes and spending, and said that, taken together, the two operations would mean a better and a more prosperous America.

Representative Busbey estimated that the 1953 total tax take of federal, state and local governments would be $91,387,000,000. He said that federal taxes would absorb 75.1%, state governments 12.2%, and local governments 12.7%.

Stoker Sales Up A Bit

Census Bureau reports placed stoker sales for March at 879 units at factory level—slightly above the February total of 844 but 20% under the March 1952 level of 1,101. Sales of stokers for large apartment houses amounted to 91 units of 4,675 horsepower compared with 99 units of 4,461 hp in February; small industrial, 36 units at 4,433 horsepower compared with 55 at 7,979 the previous month; and large industrial stoker sales, 27 units of 15,654 horsepower as compared with 26 at 13,872 horsepower in February. Sales of 655 stokers for residential use, and 70 units for small apartment houses accounted for 82% of all sales.

Uses of Titanium Explained

A pamphlet written to tell small manufacturers about the advantages of titanium as an alloy in many metals products is being offered free by the Small Defense Plants Administration. Characteristics which make titanium attractive to the metalworking industries, according to the pamphlet, are: "good strength ratio, which is maintained up to about 1,000 degrees Fahrenheit, and its endurance limit-ultimate strength ratio is unexcelled; yield strength is as high as that of better grades of steel; ductile enough for many forming operations; excellent corrosion resistance; flame impingement tests do not affect it." Copies of the leaflet may be obtained from Small Defense Plants Administration field offices.

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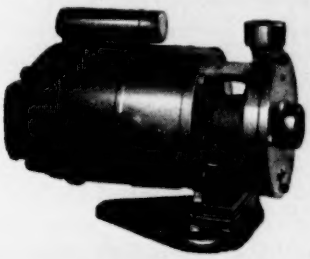
Air Conditioning

PUMPS

Easy-to-Install pumps

MEET 90% OF AIR CONDITIONING NEEDS



FHP pump

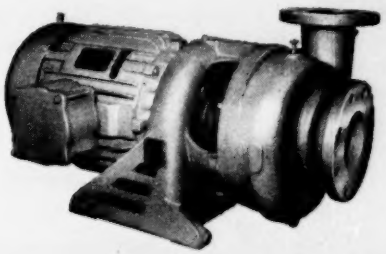
Up to 80 gpm, heads to 125 feet.

Compact pump and motor requires only two bolts for installation. Rigid construction holds alignment for longer bearing and seal life. Mechanical seal. Open impeller economy model does adequate job on many installations at very low cost. Closed impeller model for higher heads. Also available as frame-type pump for separate mounting.

Electrifugal pump

Up to 500 gpm, heads to 220 feet.

Only pump with unit-cast frame. Motor and pump are mounted on a single shaft in a one-piece rigid cast-iron frame. Alignment is rigidly held but there is plenty of space for maintenance. Installation requires only four bolts. Standard packing or mechanical seal available. Also built as frame-type pump for separate mounting.



Supporting adapter pump

Up to 2500 gpm, heads to 550 feet.

Flange motor and pump mounted on sturdy cast-iron supporting adapter. Motor and pump use same shaft. Rigidity assures vibrationless operation and long bearing life. Only four bolts required for installation. Available with standard packing or mechanical seal. Built in same ratings as frame-type pump for separate mounting.

FREE ENGINEERING HELP

YOUR ALLIS-CHALMERS PUMP REPRESENTATIVE is thoroughly familiar with pump problems in air conditioning equipment. He can offer you valuable suggestions in planning your equipment and installations. Call your Allis-Chalmers Authorized Distributor or District Office when you need help with your pump problems.

Write Allis-Chalmers, Milwaukee 1, Wisconsin, for centrifugal pump Bulletins 52B7529, 52B6140 and 52B6083 describing these air conditioning pumps. A-3971

Electrifugal is an Allis-Chalmers trademark.

ALLIS-CHALMERS

BRIEFLY STATED

• L. C. McKesson, vice-president in charge of sales, Ansul Chemical Co., Marinette, Wisc., has been elected president of the Refrigeration Equipment Manufacturers Association. He succeeds John E. Dube, president, Alco Valve Co., St. Louis, Mo. Lud Emde, president, Temprite Products Corp., Birmingham, Michigan, was elected vice-president. Other officers elected were James Emmett, Jr., vice-president of Jas. P. Marsh Corp., Skokie, Ill., treasurer; and Cecil Boling, president, Bush Manufacturing Co., West Hartford, Conn., secretary.

• A. M. Byers Co., Pittsburgh, Pa., has announced the appointment of Buckley M. Byers as general manager of wrought iron sales. Mr. Byers joined the firm in 1940, serving as assistant manager of the Washington office. Returning to the firm after war service in the Navy, he was made assistant manager of the New York office. In 1947 he became manager of the export department, and in 1951 was appointed assistant manager of steel sales. He has been a director of the company since 1948.

• At the annual meeting of the Industrial Unit Heater Association, held in Buffalo, N. Y., the following officers were elected for the ensuing year: W. G. Schlichting, president; G. A. Mathis, vice-president; and L. O. Monroe, secretary-treasurer. Mr. Schlichting is sales manager of the heating, cooling and air conditioning division of Young Radiator Co., Racine, Wisc. Mr. Mathis is vice-president in charge of production of The New York Blower Co., LaPorte, Ind.

• The Propeller Fan Manufacturers' Association elected E. C. Englert, president, E. J. Stone, vice-president and L. O. Monroe, secretary-treasurer, at its annual meeting. Mr. Englert is vice-president of Hartzell Propeller Fan Co. Div. of Castle Hills Corp. Mr. Stone is sales manager of Propellair Div., Robbins & Myers, Inc.

• The seventh Short Course on Hot Water and Steam Heating Systems will be given at the University of Illinois, Urbana, June 15, 16, 17, and 18, according to an announcement by the University and The Institute of Boiler and Radiator Manufacturers, co-sponsors of the course. The seventh short course will be similar to previous courses.

• Niagara Blower Co. announces the appointment of Ralph C. Knight to the newly created position of director of sales with offices in New York. Mr. Knight has been with the company since 1942, in charge of New England sales and application engineering.

• The American Blower Corp. has announced that Edward W. Legier has been elected a vice-president of the company. Mr. Legier began his career with the company as a sales engineer. In 1923 he was made manager of the St. Louis office, and was transferred in 1926 to New York City as manager of the industrial department of that branch. He was promoted to the position of Eastern Division sales manager in 1933, which position he occupied until the present.

• H. Richard Nielsen has been appointed sales manager of the air conditioning division of Servel, Inc. He will be succeeded as southern regional sales manager by Nils D. Sellman.

• Raymond S. Doherty has been named manager of National Packet sales in the heating division of The National Radiator Co., Johnstown, Pa. Since 1950 when he joined National Radiator, Mr. Doherty has been responsible for the sales development of the company's residential, commercial and industrial steel boilers. Another appointment announced is the naming of Sigmond Moroh as manager of accessories sales in the heating division. The heating accessories marketed by National Radiator include pumps, controls, valves and similar equipment required in steam or hot water heating systems. Mr. Moroh joined the company in 1948 and has held several posts in the heating division at the general offices in Johnstown. William C. Callihan has been named assistant manager of accessories sales. He joined the purchasing department of the company in 1946 and has been in the accessories sales department since 1949.

• The resignation of Marc G. Bluth of Chicago, as executive secretary of the Stoker Manufacturers Association, was announced May 4. The association's directors met in Cleveland on May 1 at which time Mr. Bluth's resignation, effective May 1, 1953, was accepted. Mr. Bluth will continue to act in an advisory and consulting capacity for the association which has approved the establishment of national office headquarters in Washington, D. C., where Mr. Bluth will be located permanently as a staff member of the National Coal Association.

• A new research engineering building now under construction by Modine will more than double the company's laboratory facilities in Racine, according to Clyde S. Simpelaar, Modine chief research engineer. Now 60% completed, the new structure will provide over 10,000 sq ft of floor area. Engineering development and testing laboratories serving the company's Heating and Air Conditioning Division will remain in the Administrative and Engineering Building on DeKoven Avenue.

• Paul K. Addams, president, Fitzgibbons Boiler Company, Inc., New York, was elected president of the Oil-Heat Institute of America at its thirty-first annual meeting in Chicago on April 22, 1953.

• Leon T. Mart, president of The Marley Co. of Kansas City, Mo., was elected president of the Cooling Tower Institute at the recent annual meeting of the group in San Francisco. Other officers elected for the 1953 terms were Neal B. LauBach of Hudson Engineering Corp. of Houston, vice-president; Paul R. Hoffmann of Lilie-Hoffmann Cooling Towers of St. Louis, secretary; Clayton E. Pickup of The Fluor Corporation, Los Angeles, treasurer. Executive offices of the Institute at Palo Alto, California, continue under the direction of Raymond C. Kelly.

• John H. Jennings has been named chief engineer in charge of all air conditioning activities at Servel, Inc. Mr. Jennings joined Servel a year ago as chief engineer for room air conditioners.

HEATING AND VENTILATING'S DETAIL SHEET

DIVERTERS OR DRAFT HOODS
WITH DIMENSIONS OF DESIGN

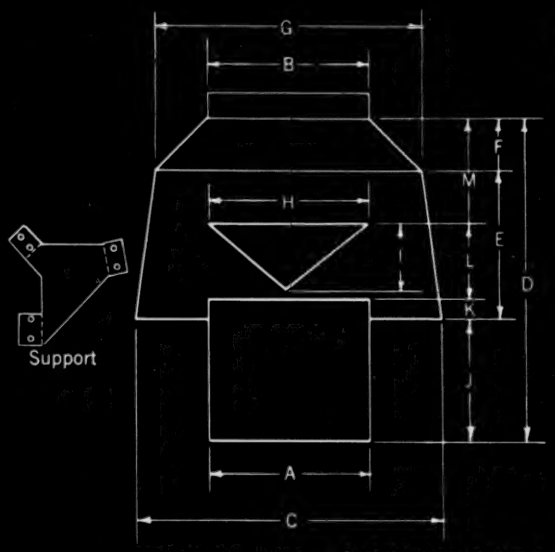


TABLE OF DIMENSIONS, INCHES

Dimension	Pipe Size, Inches									
	3	4	5	6	7	8	9	10	11	12
A	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
B	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
C	5.5	7.2	9.4	11.5	13.5	15.5	17.5	19.7	22.2	24.7
D	7.0	9.5	10.8	12.0	13.9	15.8	17.5	18.8	20.7	22.2
E	3.8	5.0	5.3	5.6	6.4	7.1	7.7	7.9	8.4	8.7
F	0.7	1.0	1.5	1.9	2.3	2.7	3.1	3.6	4.3	5.0
G	4.4	6.0	8.0	9.8	11.6	13.4	15.2	17.2	19.6	22.0
H	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
I	1.5	2.0	2.3	2.5	2.9	3.2	3.5	3.8	4.1	4.4
J	2.5	3.5	4.0	4.5	5.3	6.0	6.7	7.3	8.0	8.5
K	0.7	1.0	0.9	0.8	0.9	1.0	1.0	1.0	1.5	1.7
L	1.5	2.0	2.4	2.7	3.1	3.5	4.0	4.3	4.6	5.0
M	2.3	3.0	3.5	4.0	4.6	5.3	5.8	6.2	6.6	7.0

SUGGESTED DIMENSIONS FOR A VERTICAL DRAFT HOOD

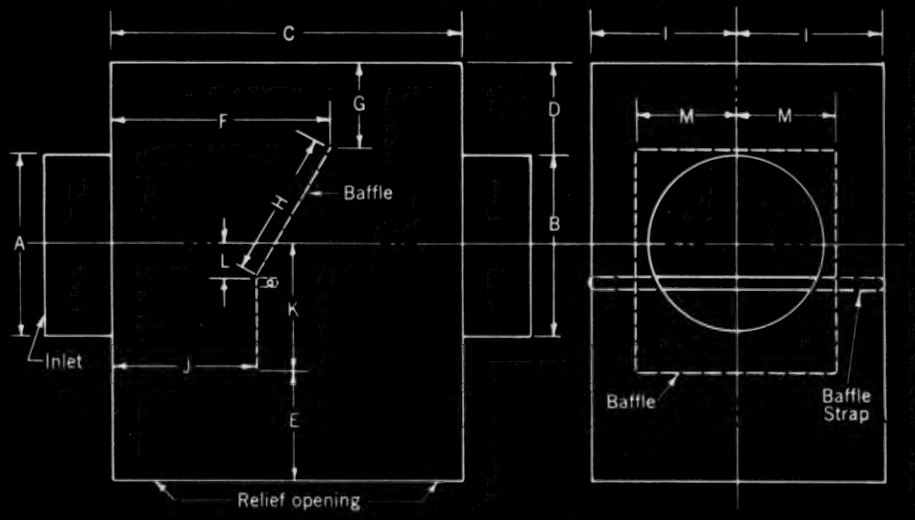


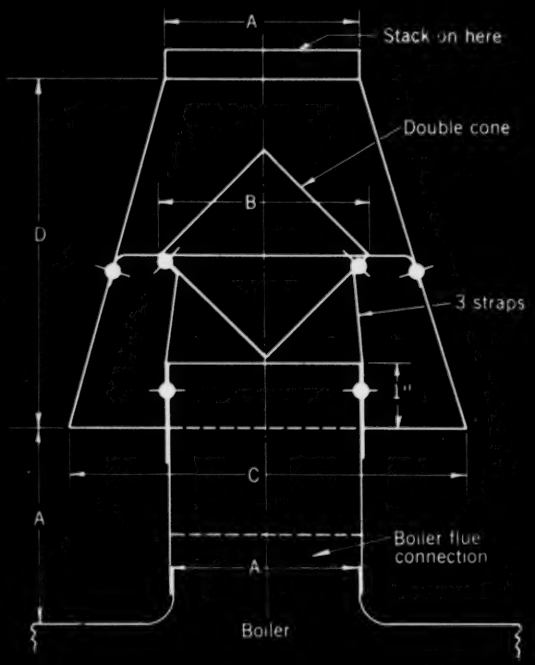
TABLE OF DIMENSIONS, INCHES

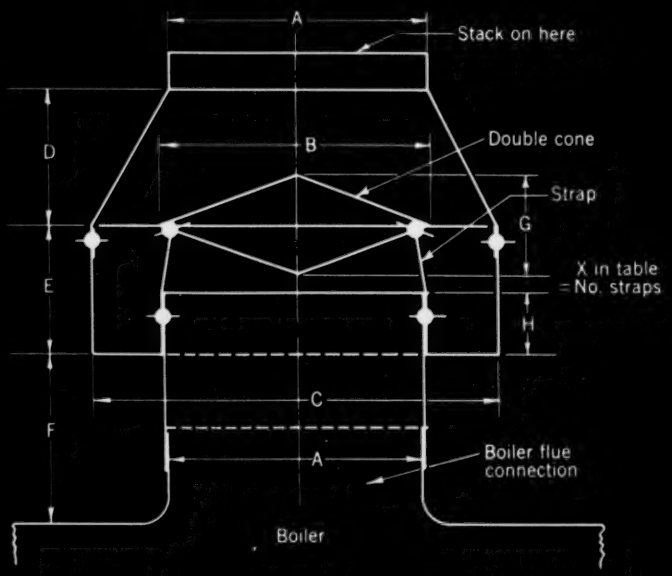
Hood Size	A	B	C	D	E	F	G	H	I	J	K	L	M
3	3	3	6	1½	4¾	3¾	1⅜	2½	2½	2½	2⅛	9/16	1¾
4	4	4	8	2	4¾	5	1⅞	3⅜	3⅜	3⅜	2⅞	¾	2 5/16
5	5	5	10	2½	4¾	6¼	2⅜	4 3/16	4 3/16	4 3/16	3½	1 5/16	2 13/16
6	6	6	12	3	4¾	7½	2⅞	5	5	5	4¼	1⅛	3½
7	7	7	14	3½	4¾	8¾	3⅜	5⅞	5⅞	5⅞	5	1 3/16	4 1/16
8	8	8	16	4	4¾	10	3⅞	6 11/16	6 11/16	6 11/16	5⅝	1½	4 11/16
9	9	9	18	4½	4¾	11¼	4⅜	7½	7½	7½	6⅜	1 11/16	5¼
10	10	10	20	5	4¾	12½	4⅞	8⅜	8⅜	8⅜	7	1⅞	5 13/16
11	11	11	22	5½	4¾	13¾	5⅜	9 3/16	9 3/16	9 3/16	7¾	2 1/16	6⅜
12	12	12	24	6	4¾	15	5⅞	10	10	10	8½	2¼	7

SUGGESTED DIMENSIONS FOR A HORIZONTAL DRAFT HOOD

HEATING AND VENTILATING'S DETAIL SHEET

DIVERTERS OR DRAFT HOODS
WITH DIMENSIONS OF DESIGN





DIVERTER DIMENSIONS, INCHES			
A	B	C	D
3	3¼	6	5½
4	4¼	8	7
5	5¼	10	9
6	6½	12	11

DIVERTERS FOR ALL BOILERS WITH VENT DIAMETERS UP TO AND INCLUDING 6 INCHES

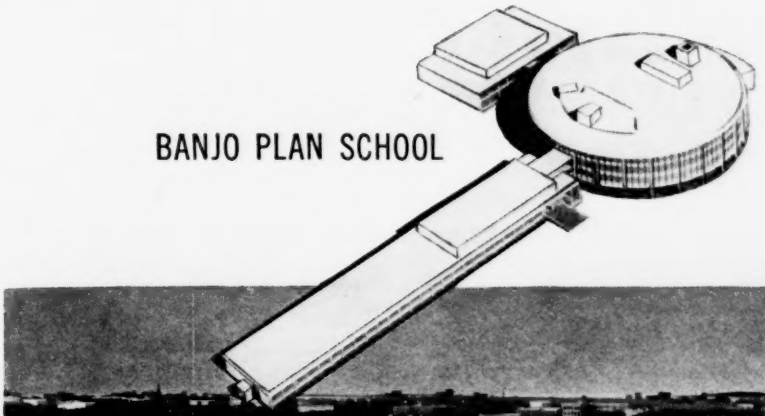
DIVERTER DIMENSIONS, INCHES								
A	B	C	D	E	F	G	H	X
6	6½	9½	3	3	4	2¼	1½	3
7	7½	11	3½	3½	4½	2⅜	1¾	3
8	8½	12½	4	4	5	3	2	4
9	10	14½	4½	4½	5½	3⅜	2¼	4
10	11	16	5	5	6	3¾	2½	4
11	12	17½	5½	5½	6½	4⅛	2¾	5
12	13	19	6	6	7	4½	3	5
13	14	20½	6½	6½	7½	4⅞	3¼	5
14	15	22	7	7	8	5¼	3½	6
15	16	23½	7½	7½	9	5⅝	3¾	6
16	17	25	8	8	10	6	4	6

DIVERTERS FOR ALL BOILERS WITH VENT DIAMETERS 6 INCHES AND OVER

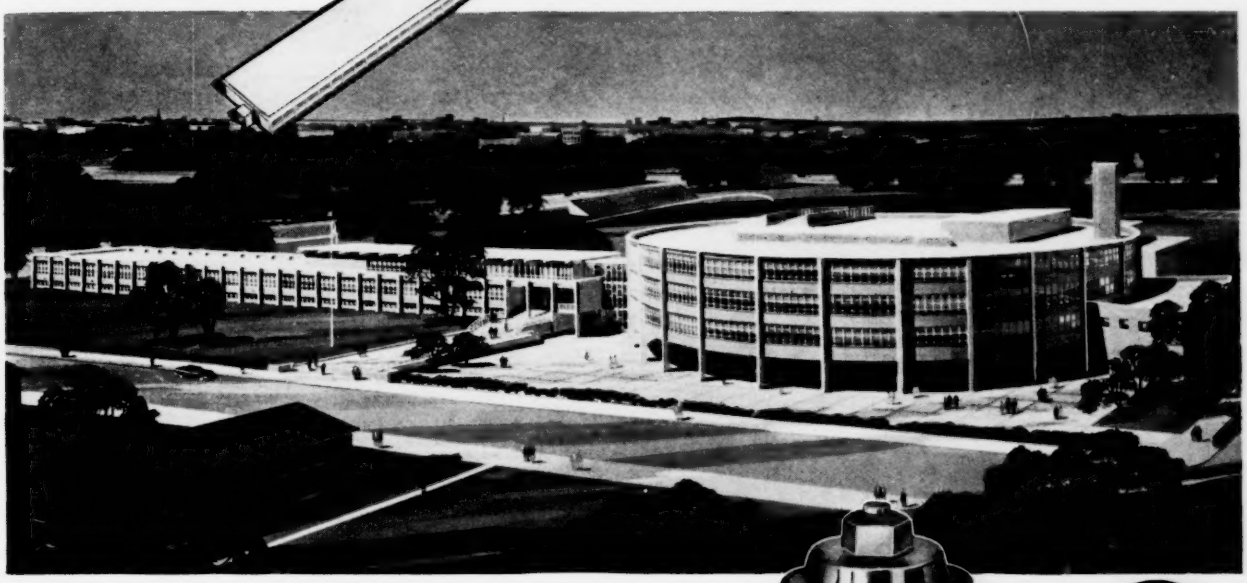
DESIGN INFORMATION THROUGH THE COOPERATION OF NEW YORK DEPARTMENT OF LABOR, DIVISION OF INDUSTRIAL HYGIENE, NEW YORK, N.Y., AND AMERICAN STANDARDS ASSOCIATION, NEW YORK, N.Y.

And in Brooklyn – A FUTURE OF FAULTLESS SERVICE

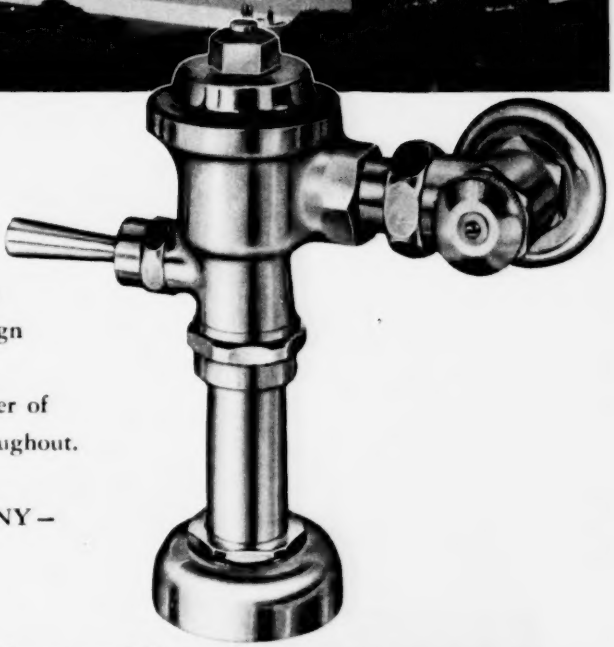
BANJO PLAN SCHOOL

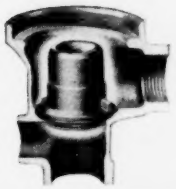


GENERAL GEORGE W. WINGATE HIGH SCHOOL
brooklyn, new york
MICHAEL L. RADOSLOVICH
chief architect
bureau of construction, board of education
KELLY & GRUZEN
architects
KREY & HUNT
mechanical engineers
R. L. GRAZIANO SONS INC.
plumbing contractor
W. H. HUSSEY & SON, INC.
wholesale distributor
AMERICAN RADIATOR & STANDARD SANITARY CORP.
plumbing fixtures manufacturer



A bold approach to school planning has given 3200 students a $6,000,000 "banjo" in this, the first high school to be built in New York City in twelve years. Here, conservatism has been abandoned in a scheme that is "unique in design and economical in operation"—an accolade that belongs equally as much to the very large number of COYNE & DELANY valves that will be installed throughout. Here, and in countless better projects where progressiveness is the keynote, you will find DELANY—"the fastest growing name in flush valves!"





The DELANY VALVE is the ONLY diaphragm type flush valve providing a renewable main valve seat, as shown at left. This feature, a basic requisite demanded in all other type valves, is just one of many contributing to the rapidly expanding prominence of DELANY VALVES. It guarantees that the flush valve will serve throughout the life of the building even should seat pitting or high pressure wire cutting occur.

DELANY *Flush* **VALVES** Since 1879

COYNE & DELANY CO. • 834 KENT AVE. • BROOKLYN, NEW YORK

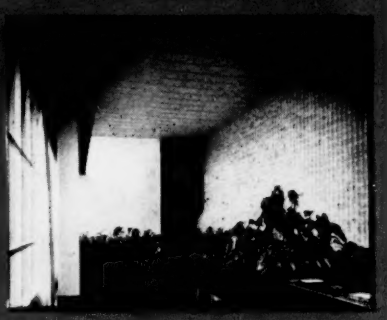
IN CANADA: THE JAMES ROBERTSON CO. LTD.

BARBER COLMAN

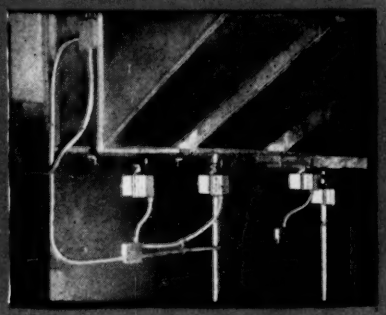
ELECTRIC Control Center

10 modern electric "Control Centers" handle the temperature requirements of CBS Television City

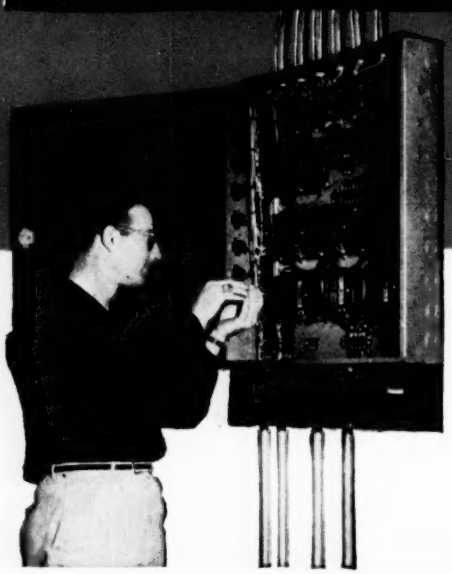
CBS Television City, Los Angeles, world's largest television plant. Architects and engineers: Pereira & Luckman. General Contractor: Wm. Simpson Co. Air Conditioning and ventilating contractor: Kilpatrick & Company—all of Los Angeles, Calif.



Brilliantly colored, ultra-modern design of lobby sets the stage for visitors to this outstanding example of contemporary architecture. Behind the scenes (below), Barber-Colman Zone Mixing Damper Controllers assure delivery of properly conditioned air to office occupants.



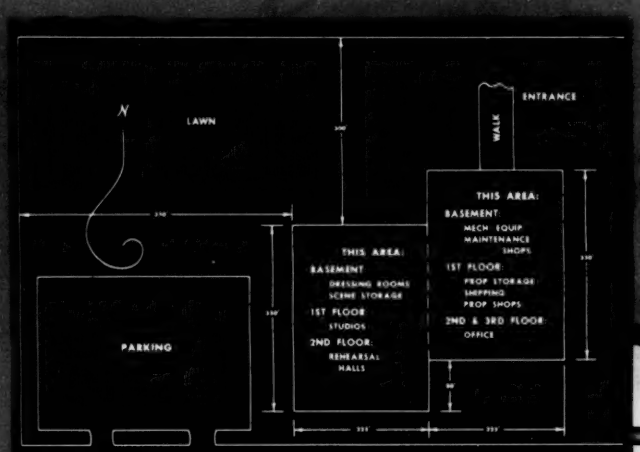
One of four giant studios, each occupying 12,100 square feet of floor space, each making unusually severe demands on the temperature control system. Combined, the four studios are geared to turn out 22 times as much "production" in a year as the largest Hollywood movie lot.



10 "Control Centers" *throughout building simplify installation, reduce costs, permit utmost flexibility for differing needs of each section of the "City." Each Barber-Colman "Control Center" houses prewired accessories—switches, relays, transformers, resistors, etc.—and numbered terminal strips for connecting all components of each electric control system. Each system can be checked, revised, or added to at its own "Control Center."*

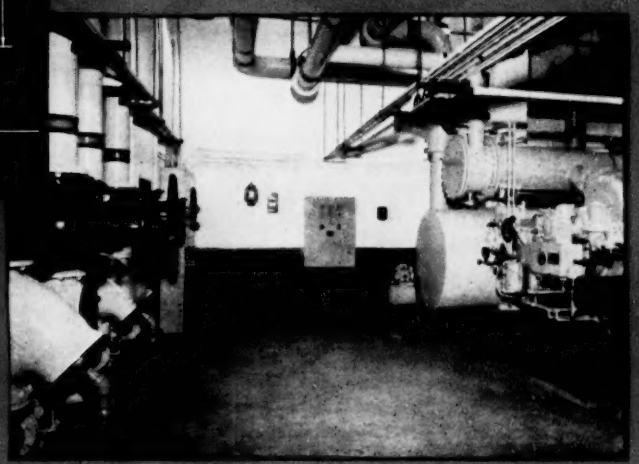
Television "City" aptly describes this unique new CBS Television production unit. Within its walls are practically all the ordinary activities encountered in a small city—plus some unusual demands on temperature control systems. It's a factory with paint shops, carpenter shops, design shops, production lines . . . an office building . . . a multiple auditorium with four huge studios, three tremendous rehearsal halls. It has 12,000 feet of exterior all-glass walls, covers 8½ acres—374,620 square feet of floor space. It's a home for hundreds of people, virtually around the clock.

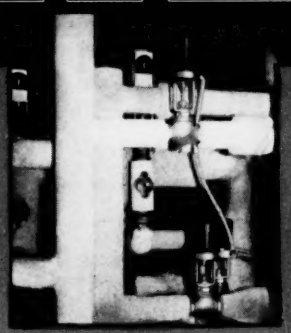
Air handling requirements called for advanced engineering experience and techniques. Sixteen fan rooms located throughout the building meet the heating, ventilating and air conditioning requirements. (Terrific heat peaks result from concentrations of light and electronic equipment.) All controls, from individual room Microtherms to three-way valves in the heating and cooling systems, are electric. All of them are components of ten Barber-Colman "Control Center" systems. Completed temperature control systems are as modern in appearance, as improved in function, as the building design. The complete story of this and other outstanding "Control Center" installations is readily available from your nearby Barber-Colman field office. For quick action, phone, or send coupon below.



Drawing (left) portrays wide range of activities centered in Television City. Flexibility of electric controls permits handling of each different temperature requirement with maximum results, minimum costs.

Partial view (below) of one centrifugal compressor and chiller at right, water pumps at left. On wall in background is one of the ten modern electric Barber-Colman "Control Centers."





Three-way motor-operated proportioning valves and two-way change-over valves handle flow of both hot and chilled water without mixing for studio conditioning.

BARBER COLMAN

ELECTRIC

Control Center

Automatic Controls • Air Distribution Products • Industrial Instruments
Aircraft Controls • Small Motors • OVERdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

BARBER-COLMAN COMPANY, ROCKFORD, ILL., U. S. A.
DEPT. G, 1602 ROCK ST.

Gentlemen: Send me more information about the CBS Television City installation and details of your "Control Center."

Individual _____

Firm Name _____

Address _____

City _____ *State* _____

Guaranteed TO SHUT TIGHT*

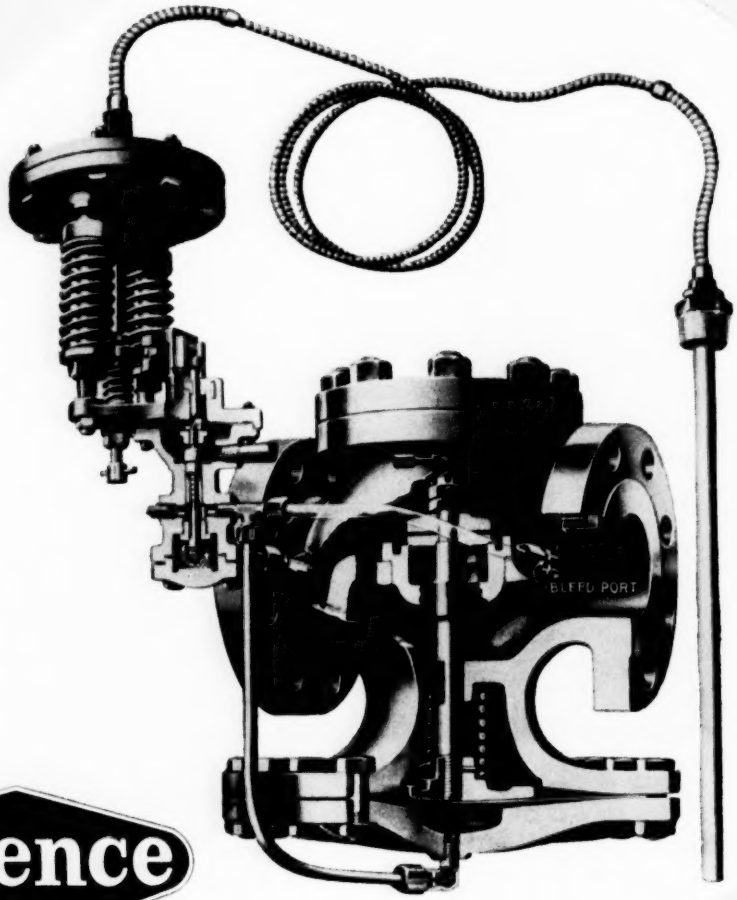
* When equipped with a SECO Metal Seat and Disc on steam service and protected by an approved Strainer, a Spence Regulator is guaranteed to shut tight when the demand for steam ceases.

Expensive steam leaks due to a lack of absolutely tight shutoff are eliminated in Spence Temperature Regulators. Here is why we can make such a guarantee:

First, our temperature regulators are of the single seat design. Seats and discs are made of durable SECO Metal. More than 20 years experience in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

These plus other design features explain why Spence Temperature Regulators function dependably and accurately year after year without requiring expensive repairs or special attention.

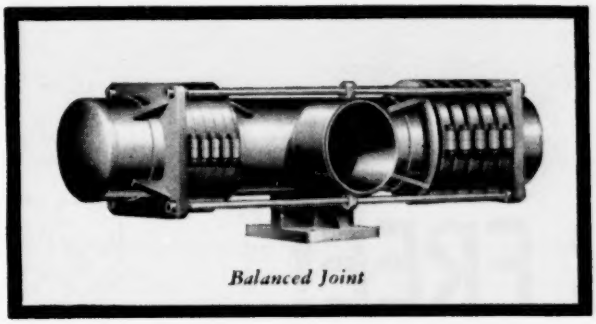
Want more facts? Write for Bulletin T50 giving full details.



SPENCE
TYPE ET150
Temperature
Regulator

Spence

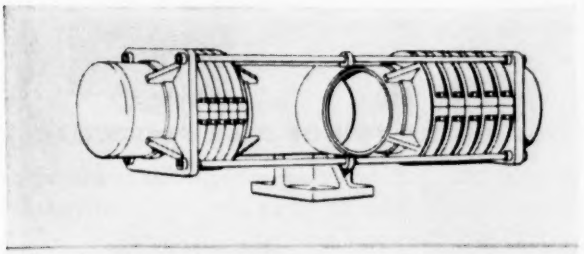
SPENCE ENGINEERING COMPANY, INC.
WALDEN, NEW YORK



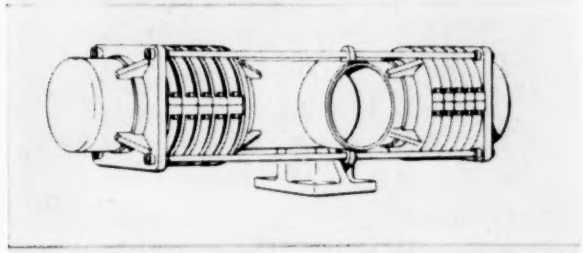
Balanced Joint

FOR A BALANCED SELECTION

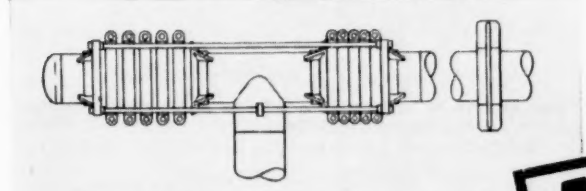
Look First at ADSCO *Corruflex* EXPANSION JOINTS



Balanced Joint Before Absorbing Expansion.



Balanced Joint After Absorbing Expansion.



When pipeline is in service, element absorbing expansion is compressed; other is extended.

• Buying an expansion joint from ADSCO is like shopping in a super-market. Everything you need is under one roof. Offering the world's most complete line of both slip and packless expansion joints, ADSCO is the only manufacturer able to supply the right joint for every purpose. ADSCO's complete line is backed up by an engineering service which since 1877 has found exact solutions to customers' special problems.

An example of ADSCO's versatility is the Corruflex Balanced Joint illustrated here. This packless expansion joint is designed to accommodate axial motion and eliminate end thrust at pipe intersections. The rods tie the joint ends together, thereby transmitting the end thrust to a distant point where adequate anchorage is available. The joint thus requires only the equivalent of an intermediate or stabilizing anchor.

So when you're shopping for expansion joints, come to ADSCO first. You won't have to look elsewhere . . . Call your ADSCO representative or write for Bulletin 35-51A.

ADSCO ENGINEERED PRODUCTS

EXPANSION JOINTS • HEAT EXCHANGERS • TRAPS • STRAINERS • SEPARATORS • METERS

AMERICAN DISTRICT STEAM COMPANY, INC.

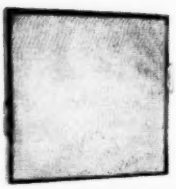
NORTH TONAWANDA, NEW YORK

Since 1877

YOURS FREE!

Farr Company Offers a Competent Staff of Field Engineers Plus Laboratory Services to Assist You with Your Air Filtration Problems

Selection of the proper air filters to meet your exact needs is most important. For this reason, Farr Company maintains competent field and laboratory engineers who are well qualified to determine the best type of filter needed to solve your particular problem. This free service can be invaluable to you in guaranteeing complete satisfaction with your air handling system.



LATEST AIR FILTER TESTING METHODS ASSURE YOU OF PEAK PERFORMANCE

After years of research, Farr engineers have developed a radically improved method of measuring filter efficiencies that takes the guess work out of air filtration. Now, for the first time, filter performance on your job can be predetermined. This eliminates costly mistakes and needless expense. This is just one of the many money-saving services available to you *at no cost*. Write today for full information on FAR-AIR* products.

SELF-WASHING FILTERS

These completely automatic units are available to meet any CFM requirement. They quickly pay for themselves in greater efficiency and drastically lowered maintenance costs.

ENGINE FILTERS

Many types and sizes of engine and compressor filters are available or can be engineered to your requirements.

ROTARY COOLERS

These efficient economical units have proven highly successful under hot, low humidity climatic conditions. They are available for commercial and home use.

PANEL FILTERS

FAR-AIR panel filters are available in many types and sizes. Each design has been engineered for peak performance and substantial economy over ordinary types.

Whatever your air filtering problem is, it will pay you to mail the coupon today for expert engineering assistance. Remember, this is a FREE SERVICE!

FAR-AIR FILTERS
"Better by Farr"

FARR COMPANY
Manufacturing Engineers
Chicago • Los Angeles • New York
Mfd under license by Control Equipment Co. Ltd., Montreal, Canada

Farr Company, P. O. Box 10187, Airport Station
Los Angeles 45, California

Gentlemen: Send me complete information on FAR-AIR products. I would ☐ would not ☐ require engineering assistance.

NAME _____ TITLE _____

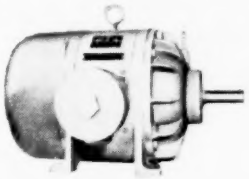
COMPANY _____

ADDRESS _____

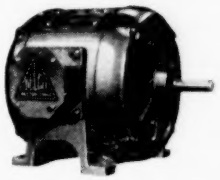
DEPENDABILITY . . .

that minimizes costs

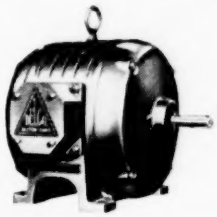
Delco Motors



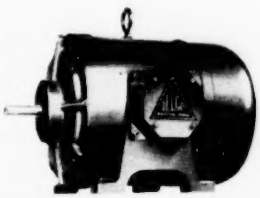
Explosion-proof motor



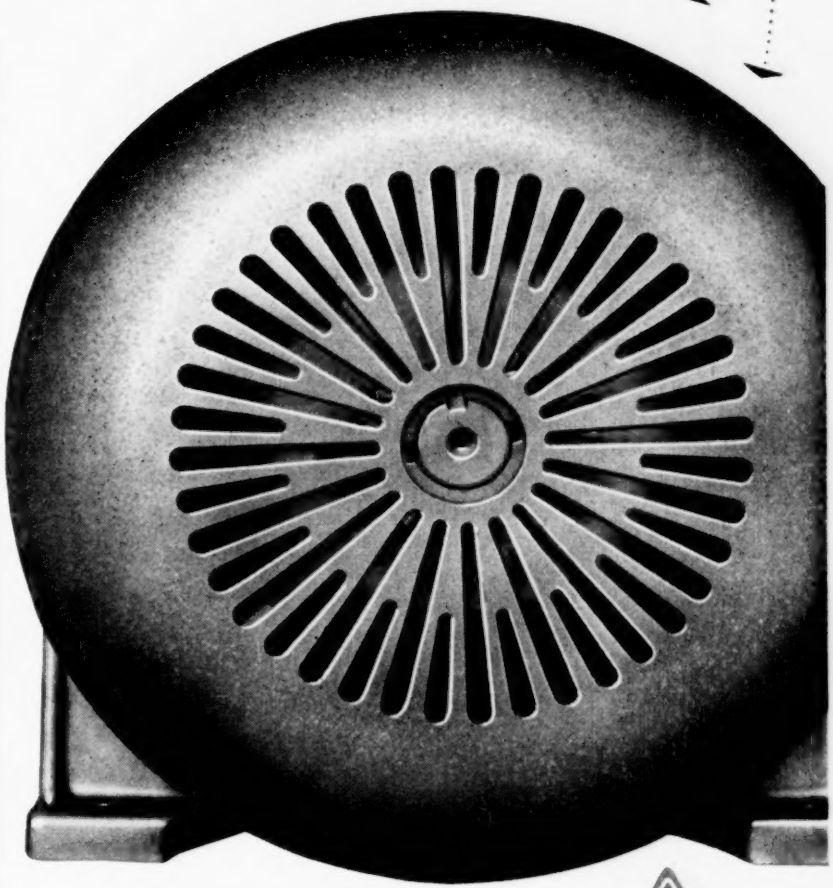
Open ball-bearing motor



Totally enclosed ball-bearing motor



Totally enclosed fan-cooled motor



With Delco integral motors on your machines you have a cost factor on which you can depend.

For Delco designs and builds with one idea in mind—to produce motors that will run dependably, under extreme conditions, for record-breaking periods of time.

Put your trust—and your motor dollars—in Delco motors . . . your nearest Delco sales office will help you with all details.

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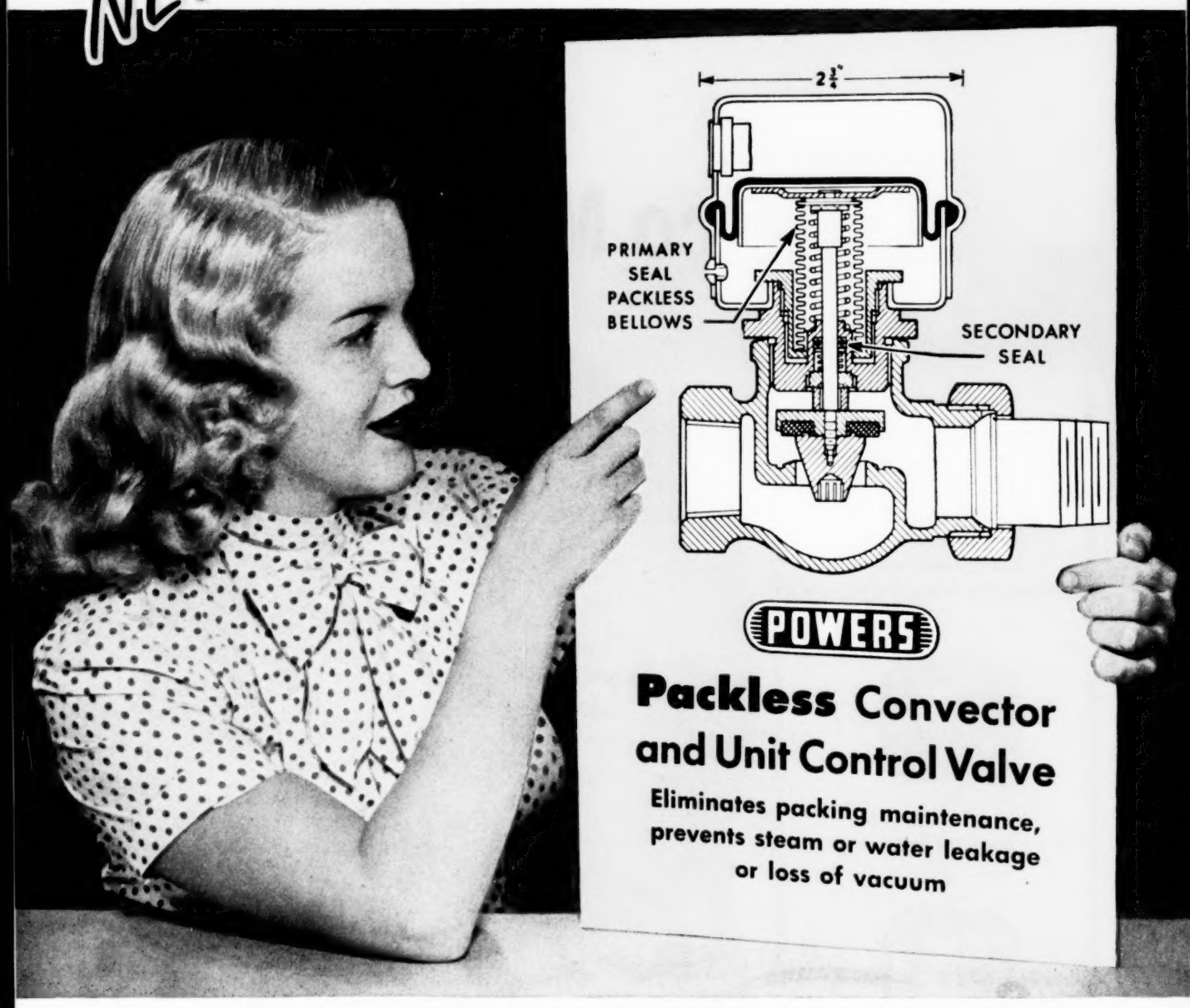
NEW! POWERS PNEUMATIC *Systems of*



POWERS

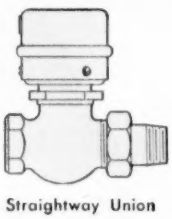
Packless Convector and Unit Control Valve

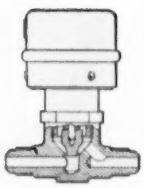
Eliminates packing maintenance, prevents steam or water leakage or loss of vacuum

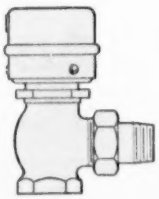
POWERS-PACKLESS-VALVES

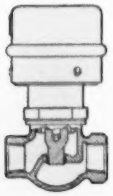
Never require re-packing.

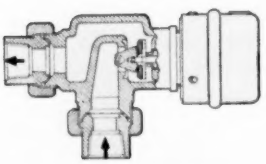
Real Economy in Maintenance year after year


Straightway Union

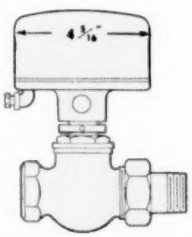

Flared Ends


Angle Union

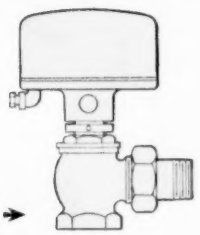

← Screwed Ends

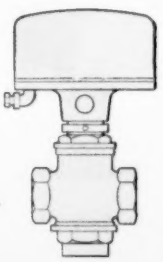

Reverse Flow Double Union

Available in various types and sizes for control of convectors, unit ventilators, unit air conditioners and radiators.



Straightway Union


Angle Union →


3-Way Screwed Ends →

Automatic Temperature Control
Now Include

POWERS-**PACKLESS**-VALVES

For Controlling Convectors, Unit Ventilators, Unit Air Conditioners and Radiators.

Now, at NO Extra Cost — users of Powers pneumatic control systems will get the additional benefits of still lower operating and maintenance costs — insured by Powers packless valves.

Duo-seal Construction Gives Them Superior Performance. Bronze packless bellows is the Primary Seal which eliminates packing maintenance — packing friction — steam and water leakage or loss of vacuum. Secondary Seal permits servicing of valve top without draining the water system or shutting off the steam supply.

Typical Specifications for POWERS-Packless-Pneumatic Control Valves

Control valves for convectors, radiators and unit ventilators shall be packless type with bronze packless bellows to eliminate steam and water leakage or loss of vacuum. This packless bellows shall be located so that it is not subject to corrosive action of the steam or water. A spring-loaded secondary seal shall be provided to permit convenient inspection or servicing of valve top without draining the water system or shutting down the steam supply.

Valve sizes shall be determined by control manufacturer for capacities specified. Type of valve body and valve top to be used shall be as required to best satisfy the application.

Valves shall be equipped with phosphor bronze bellows or Neoprene diaphragms of sufficient size to close off against specified line pressures. Diaphragms shall be replaceable. Valves shall be equipped with characterized throttling plugs to insure a measured flow of steam or water in direct relationship to the demand of the controlling thermostat.

THE POWERS REGULATOR CO.

Skokie, Ill. • Offices in Over 50 Cities in the U. S. A., Canada and Mexico
See Your Phone Book

OVER 60 YEARS OF AUTOMATIC TEMPERATURE CONTROL

Banish PACKING Maintenance

No Loss of Vacuum

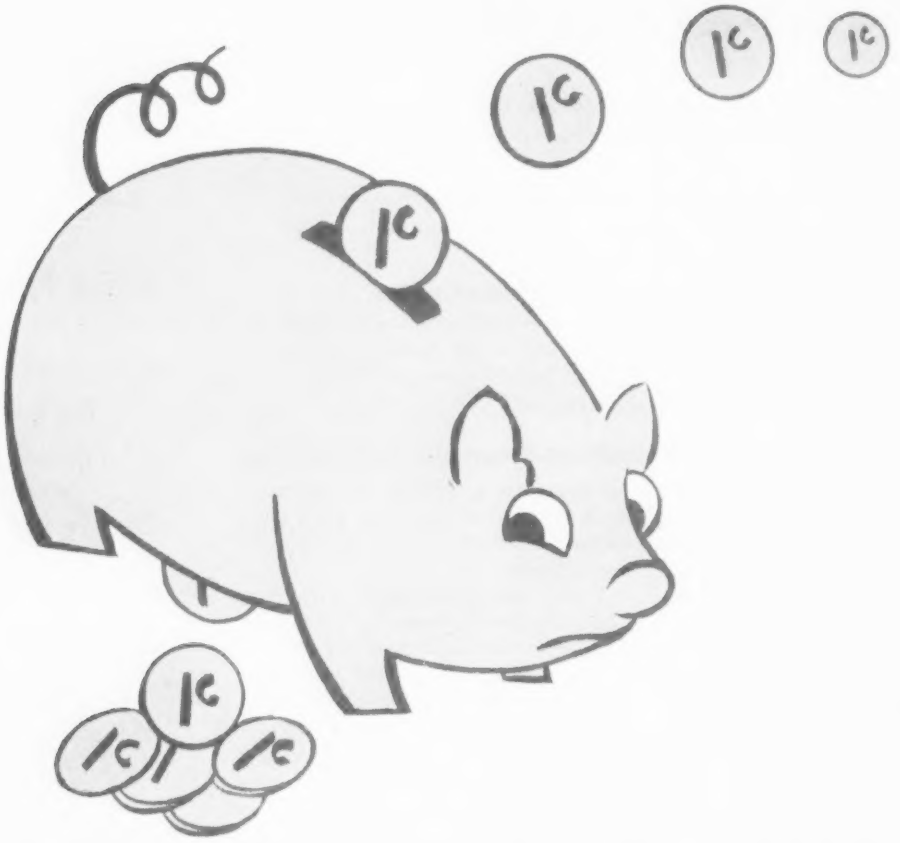
... leakage of air reduces efficiency of heating system and increases corrosion in return lines

No Steam or Water Leakage

(b18)

Only a Few of **POWERS** Complete Line of Modern Control Valves for Regulating Heating and Air Conditioning Systems

Pennies saved



• Take the case of the man who saved a few dollars on air handling equipment, which he expected to use for many years. Installation costs turned out to be high and maintenance expense excessive — more than he saved on original purchase price. Of course, not every low bidder has an inferior product; but you can be sure of one thing: if a high quality product is to meet all low bids, the quality just can't stay high!

We at "Buffalo", with seventy-five years of top quality manufacturing behind us, call your attention to the "Q" Factor.* Without it we could not have maintained the performance records chalked up in many of America's outstanding industrial plants. We have no intention of abandoning the practice of building the best possible product and pricing it afterwards.

"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

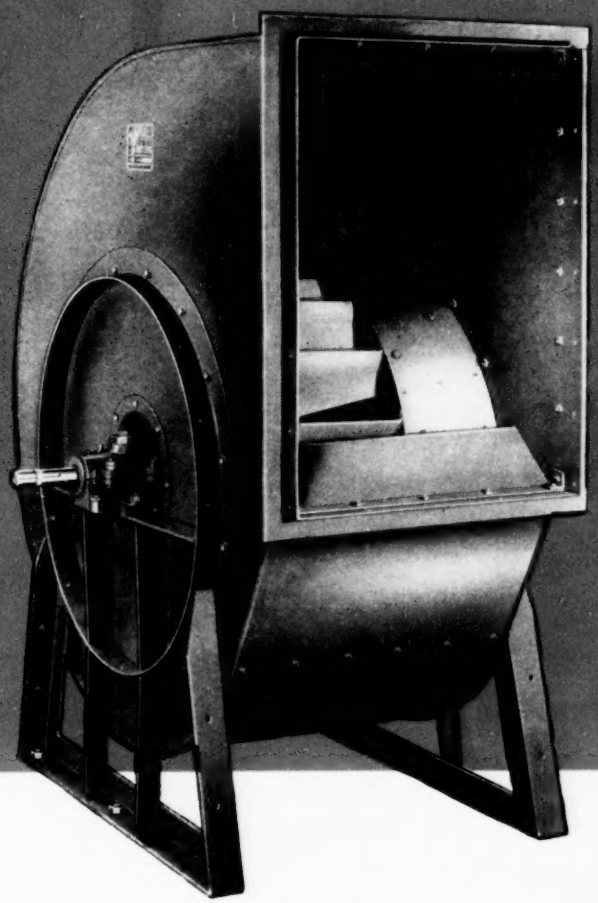
480 BROADWAY BUFFALO, NEW YORK

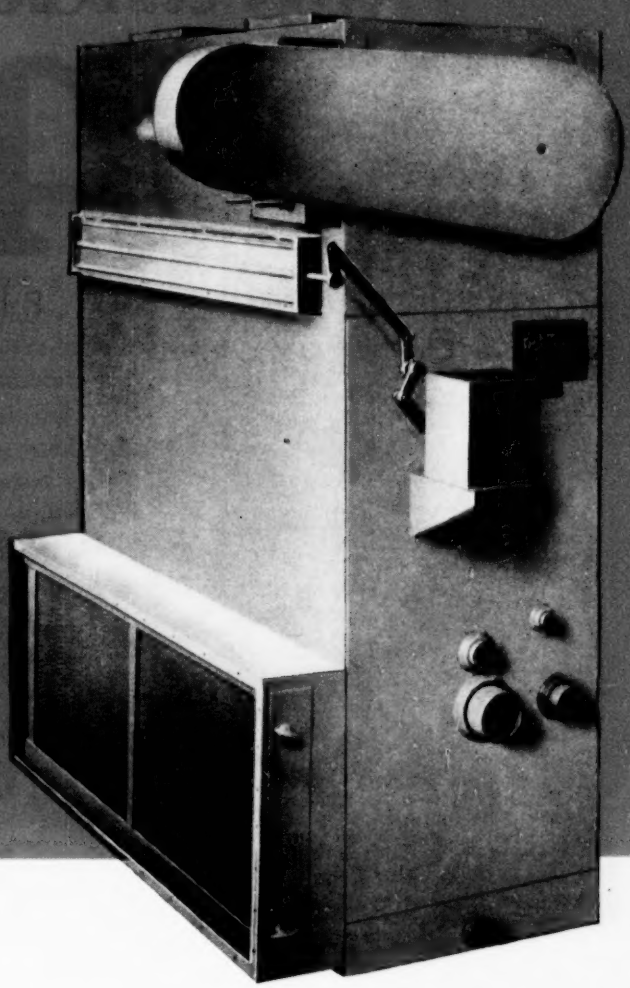
PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

• EXHAUSTING • FORCED DRAFT • PRESSURE BLOWING • VENTILATING

are not always pennies earned





VENTILATING FANS

Complete lines, the Jubilee Breezo, an efficient disk fan — the "LL", a non-overloading centrifugal — the Axial Flow, and many others for all services including forced and induced draft fans.

AIR CONDITIONING AND CLEANING EQUIPMENT

Full lines of industrial air cleaning equipment for gases and fumes, as well as air washers and cabinets for air conditioning.

"Buffalo" Engineering Sales Representatives in all principal cities are anxious to work with you. Call on them for advice without obligation.

**The "Q" Factor — The built-in quality which provides trouble-free satisfaction and long life.*

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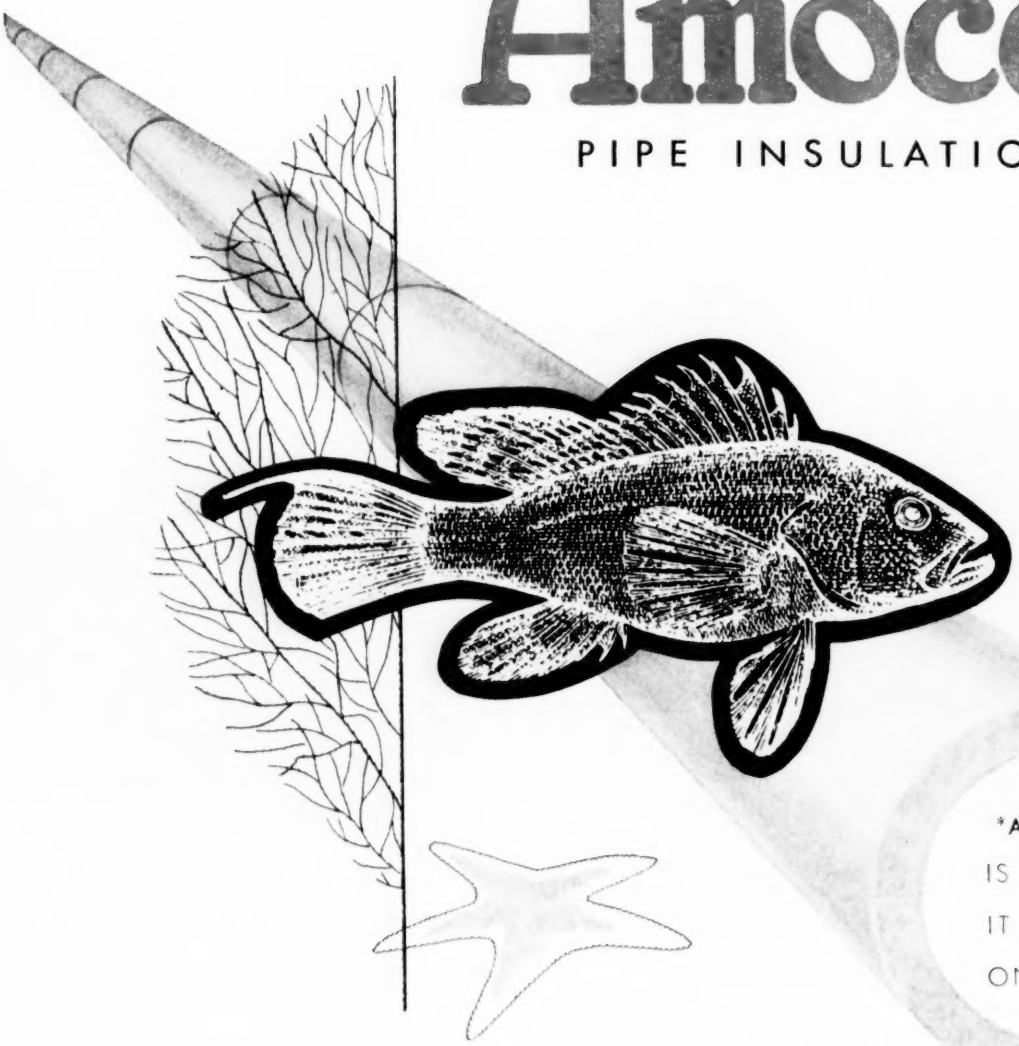
Unaffected even after weeks under water*

Amocel®

PIPE INSULATION



*AMOCEL IS RUGGED. IT STAYS ON THE JOB

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put an end to . . .

Draft dodging

WITH ANEMOSTAT

Drafts and "draft dodging" are no longer a problem when air conditioning systems are equipped with Anemostat draftless air diffusers. Anemostat air diffusers are designed to eliminate the cause of drafts. But that's not all. Anemostat air diffusers equalize temperature, humidity and assure draftless air distribution, ***the big three*** for healthful air conditioning comfort. That's why leading architects, engineers and contractors who demand the best in air conditioning equipment specify Anemostat . . . why more Anemostat air diffusers are in use than any other make.

Put an end to the "draft dodging" problem by specifying Anemostats, the draftless aspirating air diffusers.

"No Air Conditioning System Is Better Than Its Air Distribution"

ANEMOSTAT®

DRAFTLESS *Aspirating* AIR DIFFUSERS

ANEMOSTAT CORPORATION OF AMERICA

10 EAST 39th STREET, NEW YORK 16, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

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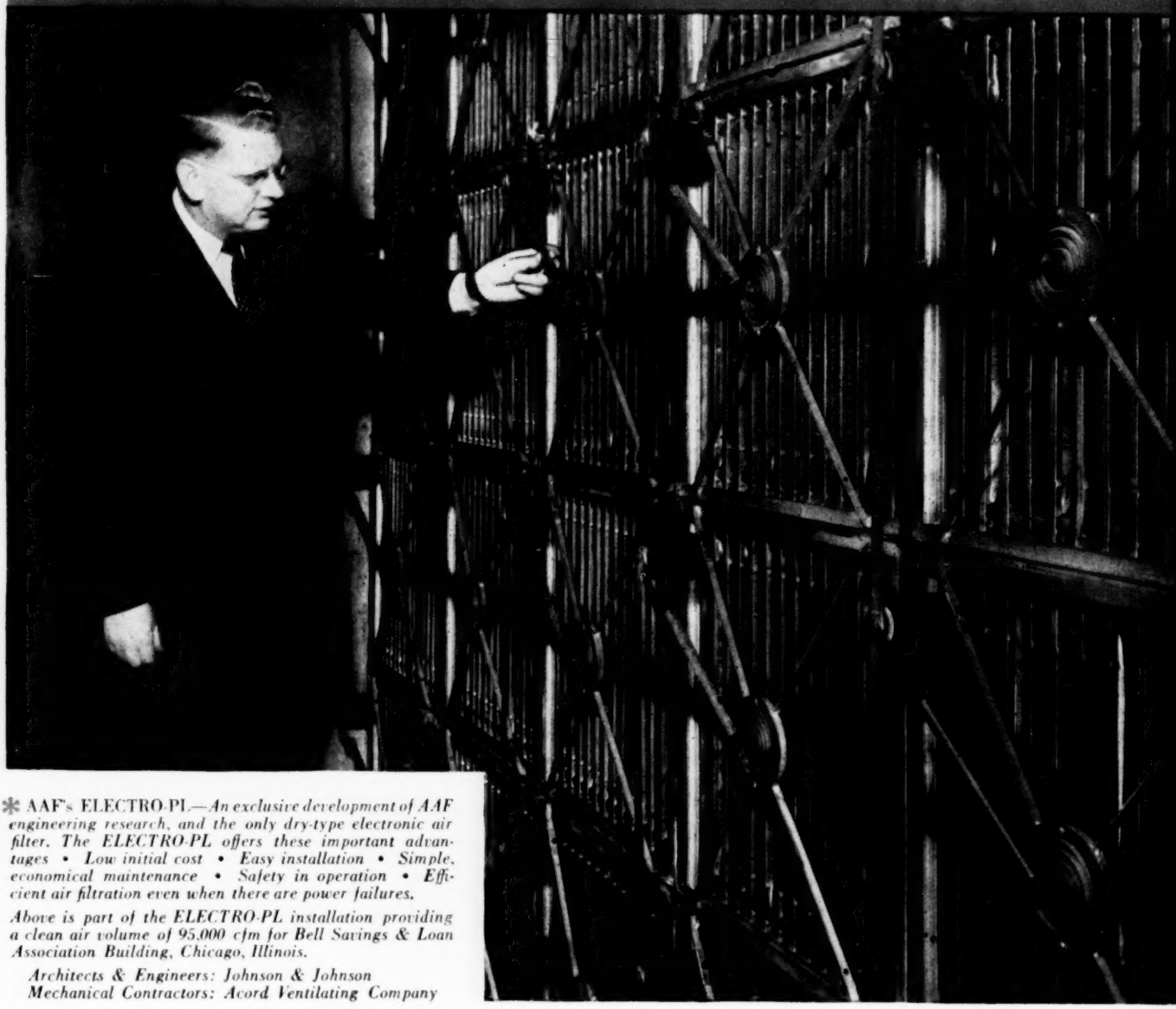
Why does AAF make

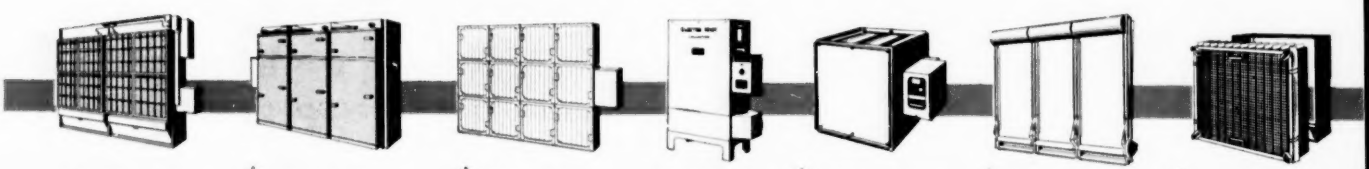


* AAF's ELECTRO-PL—*An exclusive development of AAF engineering research, and the only dry-type electronic air filter. The ELECTRO-PL offers these important advantages • Low initial cost • Easy installation • Simple, economical maintenance • Safety in operation • Efficient air filtration even when there are power failures.*

Above is part of the ELECTRO-PL installation providing a clean air volume of 95,000 cfm for Bell Savings & Loan Association Building, Chicago, Illinois.

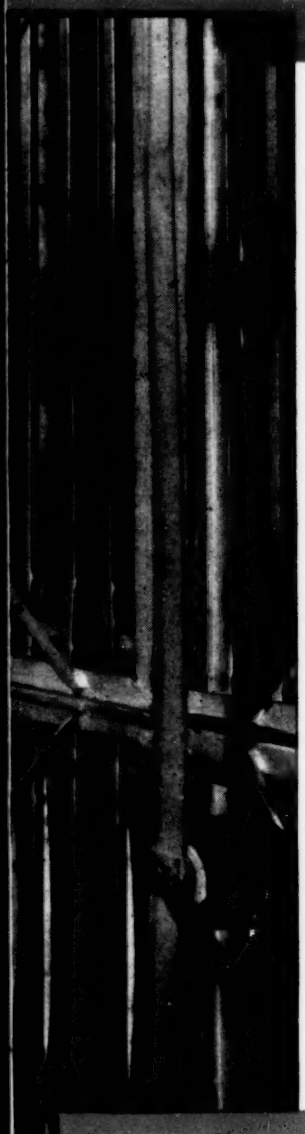
Architects & Engineers: Johnson & Johnson
Mechanical Contractors: Acord Ventilating Company

a single source for all air cleaning equipment . .



ELECTRO-MATIC | * ELECTRO-CELL | * ELECTRO-PL | ELECTRO-MIST | * ELECTRO-KLEAN | * AUTO-AIRMAT | * AIRMAT PL-24

8 dry-type* air filters?



THE answer is simple, but *important* to all Engineers and Executives responsible for air cleaning applications. AAF's eight different dry-type air filters were specially designed to meet the complex combination of factors that faces the engineer in solving dust and air contamination problems. Years of experimental work and thousands of individual installations have proved that at least six basic types are necessary to allow adequate latitude in specification, and to meet job requirements both practically and economically. Today, AAF's dry-type filters provide a wide range of operating and maintenance characteristics — from the AUTO-AIRMAT (fully automatic and self-cleaning) to simple replaceable units.

AAF's eight types of dry filters offer the engineer maximum flexibility in combining the following factors to fit specific job requirements:

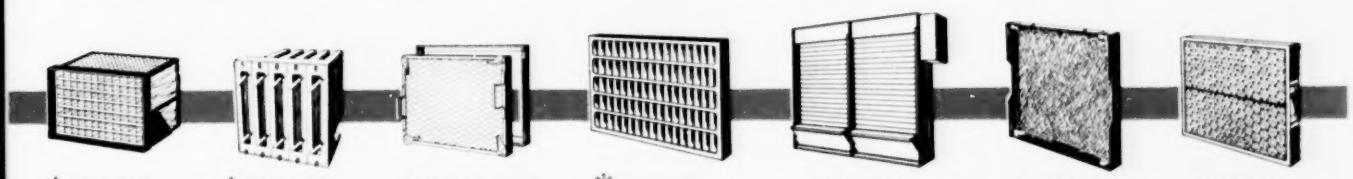
- Cleaning Efficiency
- Maintenance Methods
- Space Requirements
- Sizes and Air Volumes
- Practical and Realistic Range of Costs

In addition to a complete line of air cleaning equipment AAF also offers the services of a nationwide engineering staff, which is recognized as the leading authority in this field. The specialized knowledge of these experts can save you time, effort and expense and is at your disposal.

Complete engineering data is available on all AAF equipment. Contact your nearest AAF representative or write direct to us.

American Air Filter
COMPANY, INC.
294 Central Avenue, Louisville 8, Ky.

AMERICAN AIR FILTER OF CANADA, LTD., MONTREAL, P. Q.

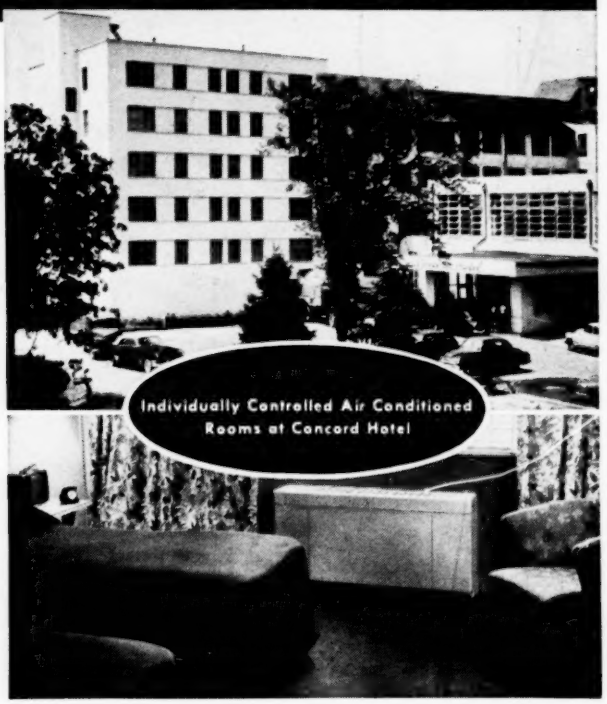


* DEEP-PAK | * DEEP BED | M/W-H/V UNITS | * DRIFILTER | MULTI-DUTY | RENU-GLAS | AMER-GLAS

Another interesting REMOTAIRE installation!

Individual-room remote type units in resort hotel provide year 'round air conditioning

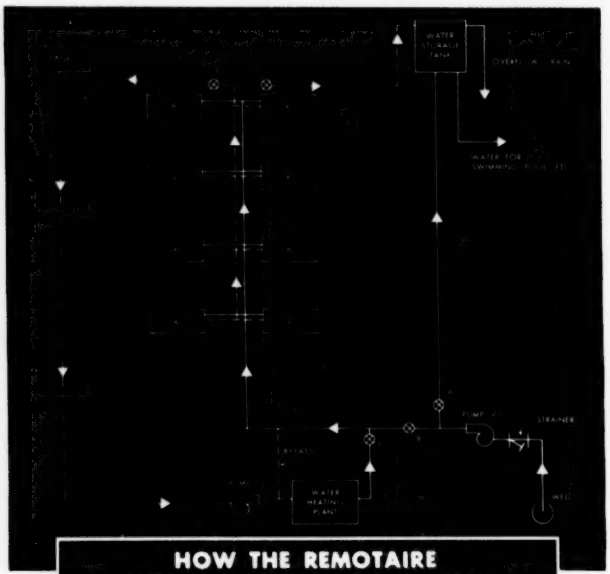
Summer cooling... winter heating



● The Concord Hotel, Kiamesha Lake, New York, found the answer to efficient, economical year 'round air conditioning through the installation of the Remotaire Well Water System—one of a number of different Remotaire systems available for multi-room buildings.

The Remotaire Well Water System may be used in localities where well water is known to be available in adequate supply, proper temperature, and of good quality. The cold well water is used in lieu of a water chilling plant. Consisting of Remotaire Room Units in each room connected by a piping system to the central plant equipment (as shown in the diagram), this system costs less to install and less to operate. Individual control of each Remotaire unit allows the occupant to choose the room temperature that suits him best without affecting adjoining rooms.

This resort hotel installation is another example of the versatility of the Remotaire for hotels, motels, hospitals, apartments, and other multi-room buildings.



HOW THE REMOTAIRE WELL WATER SYSTEM WORKS

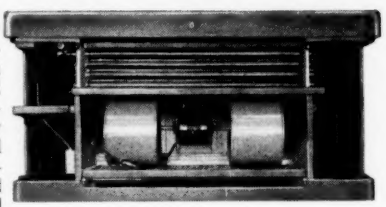
The Remotaire Well Water System consists of Remotaire Room Units in each room connected by a simple piping system to the central plant equipment—a well with pump, water heater, water circulating pump, expansion tank, storage tank and water filter or strainer as shown above.

FOR COOLING—Valves A and C are closed. B is open. Pump No. 1 pumps water from well to Remotaire units on each floor from which it travels thru valve D to storage tank on roof. This water is usable for swimming pool or other purposes.

FOR HEATING—Heating circuit includes Water Heater, Valve C, Valve E, Expansion Tank, Pump No. 2 and bypass. For operation, close Valves B and D, start Pump No. 2 and boiler, and the hot water circulates through the system.

When cooling is not required, well water may be used for other purposes, and can be pumped direct through Valve A to Water Storage Tank by Pump No. 1.

Top Quality Construction... Easy To Install



The Remotaire is sturdily built of heavy-gauge steel—plus a reinforced air grille—with a bonderized, baked-on semi-gloss enamel finish. All air passages are acoustically insulated for thermal efficiency and quietness. Coil is designed for right or left hand connections. Spacious end compartments permit easy access to coil connections and controls. Adaptable to a variety of ventilation systems, the Remotaire is ideal for modernization as well as new construction and is available in three models—200, 400 and 600 cfm.

Write for Remotaire Brochure, Form 298.

American Radiator & Standard Sanitary Corporation
P. O. Box 1226, Pittsburgh 30, Pa.

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HEATING-COOLING

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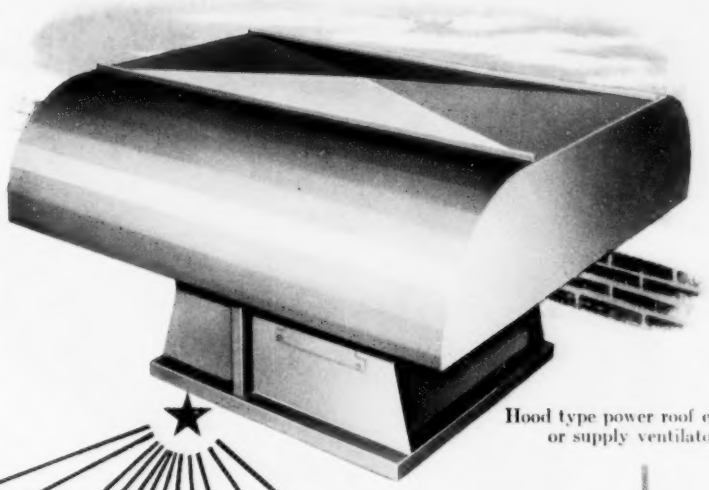
DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

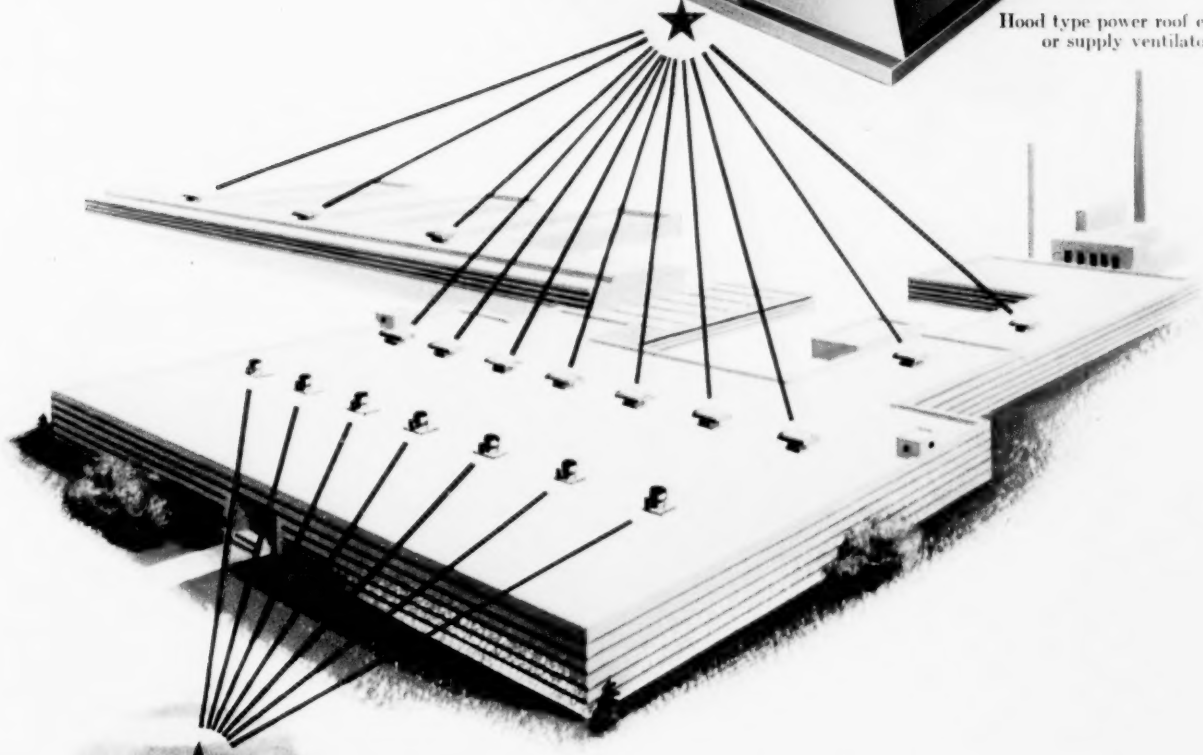
AMERICAN BLOWER

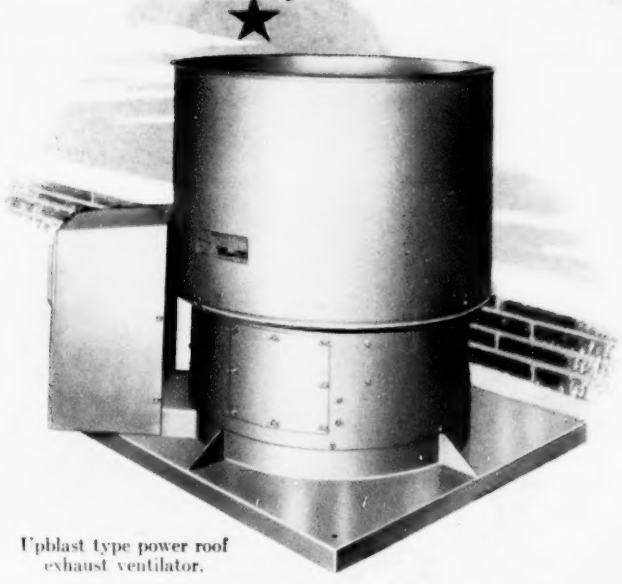
Power

Roof Ventilators



Hood type power roof exhaust or supply ventilator.





Upblast type power roof exhaust ventilator.

American Blower *power* roof ventilators give you the advantages of balanced ventilation, without the uncertainties of gravity units or the expense of a central system.

They're quickly and easily installed on all types of roofs. No extensive duct work is required; no valuable floor space is wasted. Use single units for spot ventilation; several units for large area coverage. American Blower power roof ventilators, supply or exhaust, are available in a wide range of capacities. They are designed to furnish balanced ventilation to industrial plants and commercial buildings.

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CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

AMERICAN BLOWER

YOUR BEST BUY IN AIR HANDLING EQUIPMENT

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Deepfreeze Distributing Corporation's Sub-Zero Chilling Machine, equipped with two Allen-Bradley Bulletin 709 Automatic Starters.

Why are Allen-Bradley starters so popular for refrigeration and air-conditioning service? . . . Because they do not require regular attention, they are trouble free. Only ONE moving part. No pivots, pins, or bearings to corrode or stick . . . no jumpers to break. You install them . . . and forget them!

No contact maintenance . . . Allen-Bradley cadmium silver alloy contacts never need cleaning, filing, or dressing.

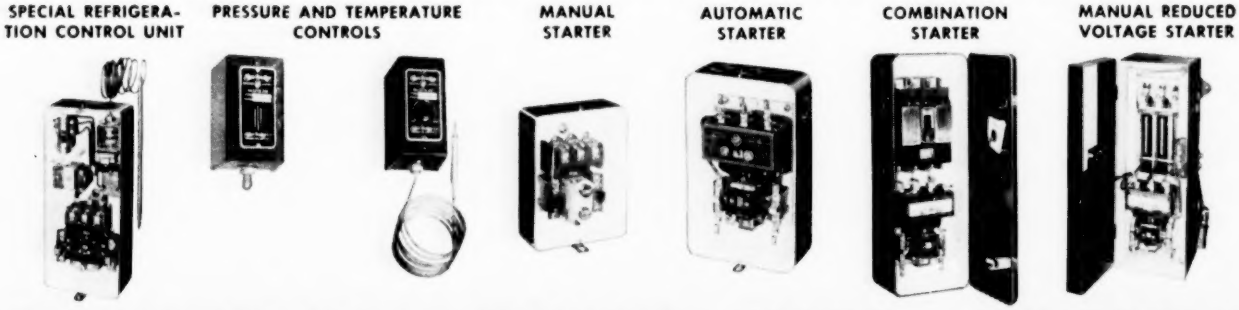
Dependable overload relays . . . Allen-Bradley thermal relays are dependable and remain accurate in their operation, even after long service.

The Allen-Bradley trademark stands for millions of trouble free operations.

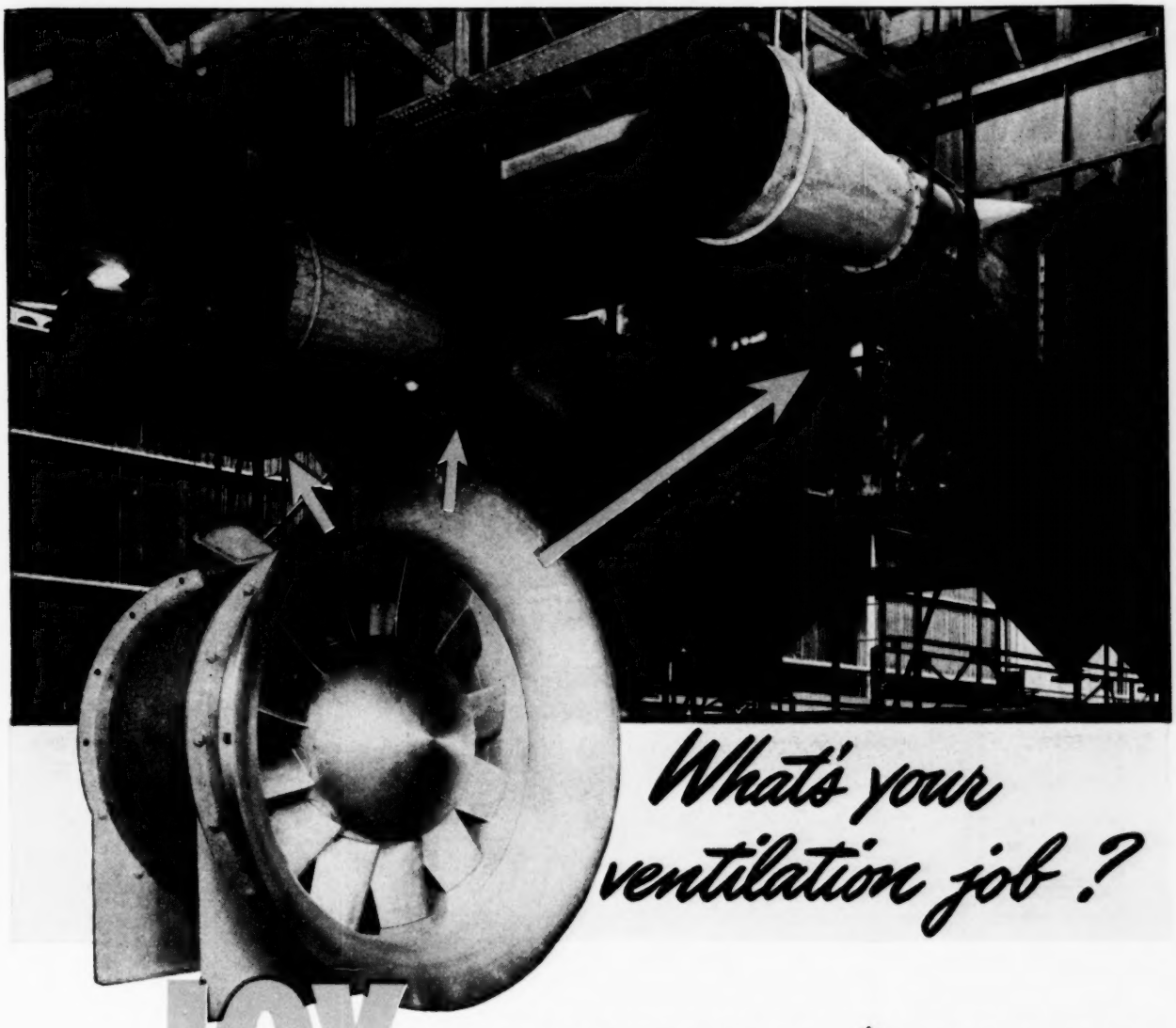
Install Allen-Bradley motor controls in your equipment today for rugged, reliable performance.

Allen-Bradley Co., 1330 S. Second St., Milwaukee 4, Wis.

TYPICAL ALLEN-BRADLEY REFRIGERATION CONTROLS



ALLEN-BRADLEY QUALITY MOTOR CONTROLS



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WILL DO IT MORE EFFICIENTLY AND MORE ECONOMICALLY!

Write for Bulletin, or *Consult a Joy Engineer*

From every possible angle, JOY Series 1000 AXIVANE Fans will give you a better, lower-cost job. Their inline, vane-axial design is lighter and more compact; and they operate more quietly, require less power and space, and save greatly on installation time and costs. What's more, you get the extra flexibility of adjustable blades—a standard JOY feature—permitting easy and quick on-the-job regulation of pressure or volume over a wide operating range, with positive protection against motor over-load. ● Whatever your job is, JOY AXIVANE Fans can show you advantages—let us work with you.

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IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

Now! Install air conditioning

READY TO INSTALL . . . the new TRANE Cold-Generator is a complete mechanical refrigeration machine—wired, piped, refrigerant-charged . . . all interconnected for immediate comfort or process cooling applications.

new TRANE Cold-

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING AND VENTILATING EQUIPMENT

. . . as easy as heating!

Easy to install! New packaged water chiller . . . wired, piped, refrigerant-charged at the factory. All you do is make simple piping and wiring connections!

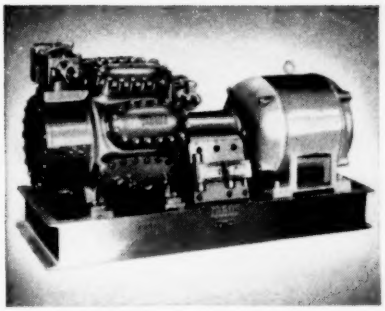
If you've decided to expand with the growing air conditioning business . . . here's your chance! Now you can install complete mechanical refrigeration for air conditioning systems in hotels, office buildings, motels, theaters, stores . . everywhere . . . with the new TRANE Cold-Generator. All the refrigerant piping, wiring, evacuating, dehydrating and charging is done for you at the factory.

The new TRANE Cold-Generator is a complete liquid chiller in one compact assembly. Built in 6 sizes from 10 tons up. Delivered ready-to-run as soon as simple plumbing and electrical connections are made.

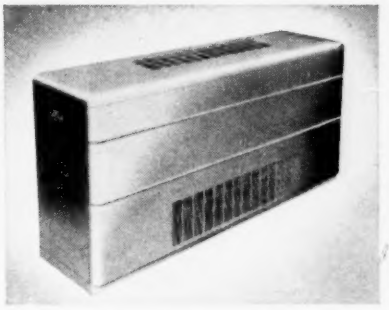
Here's what you get. Compressor and motor, condenser, insulated dry expansion chiller, insulated heat exchanger, refrigerant piping, safety valves, wiring and automatic controls. Everything is there . . . carefully engineered, exactly matched, completely assembled.

Get full information at once. See how the new TRANE Cold-Generator is as easy to install as a heating system . . . can be installed for process or comfort applications. See for yourself how this new packaged refrigeration machine can bring you packaged profits! Contact your TRANE representative or write to TRANE, La Crosse, Wis.

NO JOB TOO LARGE OR TOO SMALL FOR TRANE AIR CONDITIONING EQUIPMENT



For jobs from 3 to 50 tons, the TRANE Reciprocating Compressor packs maximum performance into minimum space. Factory assembled. Easy to install. Available with shell-and-tube condenser above compressor.



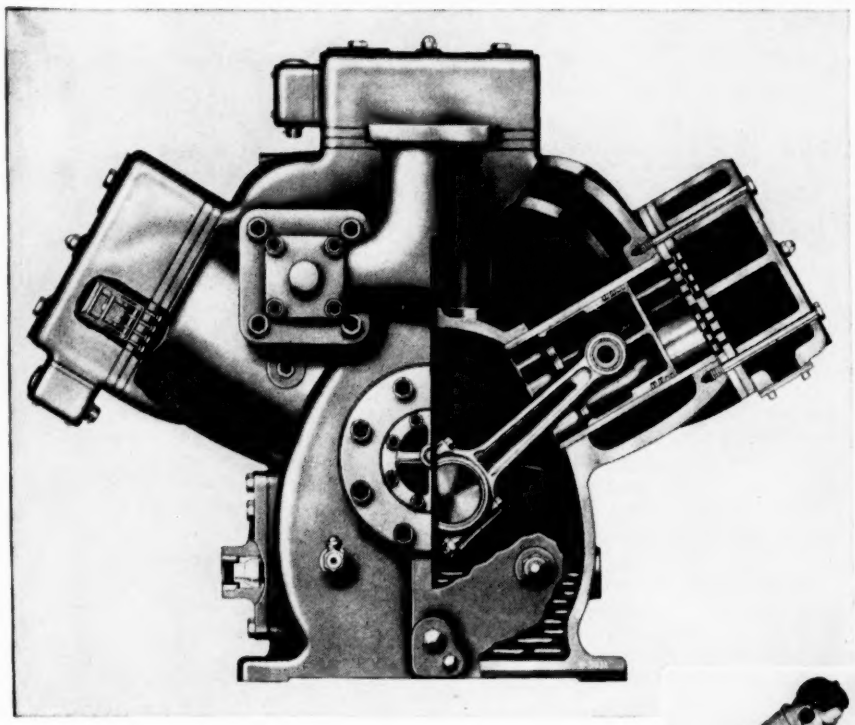
UniTrane units give tenants complete room-control of air conditioning. One standard piping circuit supplies units with hot water in winter . . . chilled water in summer from TRANE Cold-Generator or larger CenTraVac.

In a package—TRANE Self-Contained Air Conditioners require only simple piping and electrical connections. Capacities from 3 to 20 tons. Water-saving evaporative condenser optional in the 10, 15 and 20-ton models.

Generator *brings you comfort or process cooling . . . in a package!*

The Trane Company, La Crosse, Wisconsin • Eastern Manufacturing Division, Scranton, Pennsylvania • Trane Company of Canada, Limited, Toronto • 87 U.S. and 14 Canadian Offices

Optimum-speed Freon compressor has high capacity plus long life!



New Worthington unit combines advantages of low and high speed

CUTAWAY VIEW of the new Worthington "J" compressor—the product of years of engineering research. Maximum capacity, with no loss in operating efficiency, is yours with this lighter-weight, optimum speed machine.

The problem was to design a compressor that would combine the advantages of *low*- and *high*-speed operation. Worthington's answer: the new, *optimum*-speed "J" compressor—a compact, high-capacity machine with the same high operating efficiency and life expectancy as its lower speed predecessors.

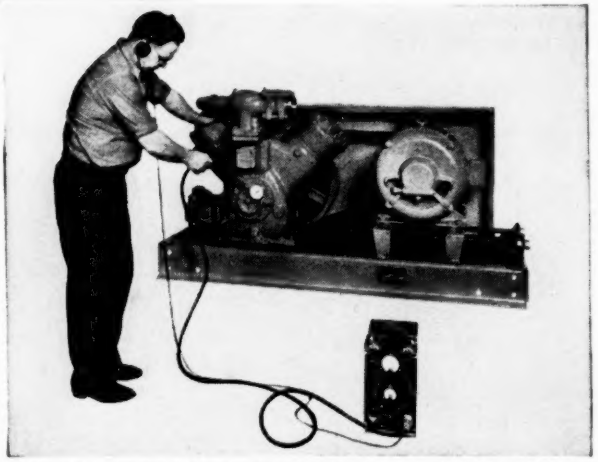
Here are just three of the many advancements in functional design that make the Worthington "J" line of compressors the finest available today.

1. ELECTRIC UNLOADING—a new achievement in variable capacity control. You can start compressor unloaded with a normal torque motor; power consumption is automatically balanced with load requirements. Separate unloader units in cylinder head allow easy maintenance . . . no complicated oil or gas pressure lines to worry about.

2. IMPROVED INTERNAL MANIFOLDING—cool suction gas completely surrounds the cylinder walls, providing longer valve life and increased overall efficiency. All passageways between suction discharge and shutoff valves are cast integrally within the crankcase, eliminating outboard fittings.

3. NEW FORCE-FEED LUBRICATION SYSTEM—full pressure, positive lubrication, regardless of rotation. A new rotary oil pump, driven directly by the crankshaft, eliminates complicated and noisy gear trains. Pump filters oil through a strainer in the crankcase.

Available in sizes of 3 to 150 tons, the new "J" compressors can be supplied with a horizontal shell and tube condenser, or they may be used with the Worthington Evaporative Condenser. Get in touch with your nearest Worthington district office, or write to Worthington Corporation, Air Conditioning and Refrigeration Division, Holyoke, Mass.



THIS ELECTRONIC LEAK DETECTION TEST is part of the rigid testing that every Worthington compressor goes through before leaving the factory. Pressure tests, underwater tests and vacuum tests make sure that every unit will give long, trouble-free service.

From the most complete line . . . comes the correct recommendation

WORTHINGTON

Air Conditioning and Refrigeration

A.3.3

ADJUSTABLE PIPE HANGERS AND SUPPORTS

for every piping requirement

NO. 5 OF A SERIES SHOWING THE GRINNELL LINE

SOCKETS
COUPLINGS
TURNBUCKLE

Socket only for split ring fig. 110R 3/8 to 3/8 in. rod

Weldless eye nut fig. 290 3/8 to 1 1/2 in. rod

Forged steel clevis fig. 299 3/8 to 1 1/2 in. rod

Turnbuckle drop forged steel fig. 230 3/8 to 1 1/2 in. rod

Rod coupling fig. 136 3/8 to 3/8 in. rod

Adj. swivel coupling fig. 134 3/8 to 3/8 in. rod

Turnbuckle adjuster fig. 114

Rod coupling fig. 208 toggle bolt fig. 209 3/8 to 3/8 in. rod

U-HANGERS
EXTENSION
CEILING PLATE

Standard U bolt fig. 137

Adj. wrought U pipe hanger fig. 252 3/8 to 3/8 in. rod

Extension piece fig. 157 3/8 to 3/8 in. rod

Spring Ceiling plate fig.133 3/8 to 3/8 in. rod

ASSEMBLIES

Split ring with socket and coach screw

Split ring, socket and ceiling flange

Extension split ring hanger fig. 139

Adj. swivel ring with coach screw fig. 100

Adj. clip hanger fig. 106

Call your local Grinnell Distributor, or write for Hanger Catalog.

GRINNELL

AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports
Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

New Modular MULTI-VENT® concealed ceiling panels

COSTS NO MORE

than ordinary air diffusing systems!

Yes! That is the big news in commercial, institutional, and industrial air conditioning for 1953.

Now you can specify this superior low velocity pressure displacement type of air distribution for metal pan ceilings at the same *or lower* cost than the high velocity injection type.

This is possible because the new MODULAR PANELS are so extremely simple and rapid to install. They can be assembled and installed in a few seconds by hand without the use of tools —a tremendous saving in labor cost!

Distributing air by Multi-Vent's gentle pressure displacement assures perfectly even air motion, and exceptional uniformity and control of room temperatures. The total absence of strong air streams or blow eliminates all the usual sources of draft complaints and permits complete freedom in locating panels and in relocating partitions.

Write today for detailed literature.

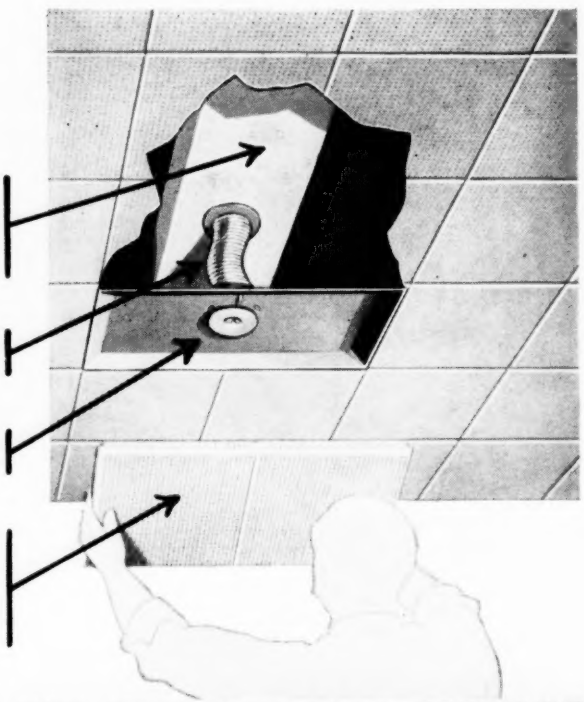
LABOR SAVING INSTALLATION FEATURES

■ **ADAPTABLE** . . . Duct can be shop built with 3-inch diameter openings at approximate panel locations. Duct work can be installed, flexible tubes with valve snapped in, and system balanced prior to and independent of ceiling erection. Panels can be located without regard to position of lighting fixtures and partitions.

■ **FLEXIBLE** . . . compressible tubing permits wide latitude in alignment, thus radically reduces installation cost by eliminating all need for time consuming close fitting sheet metal work.

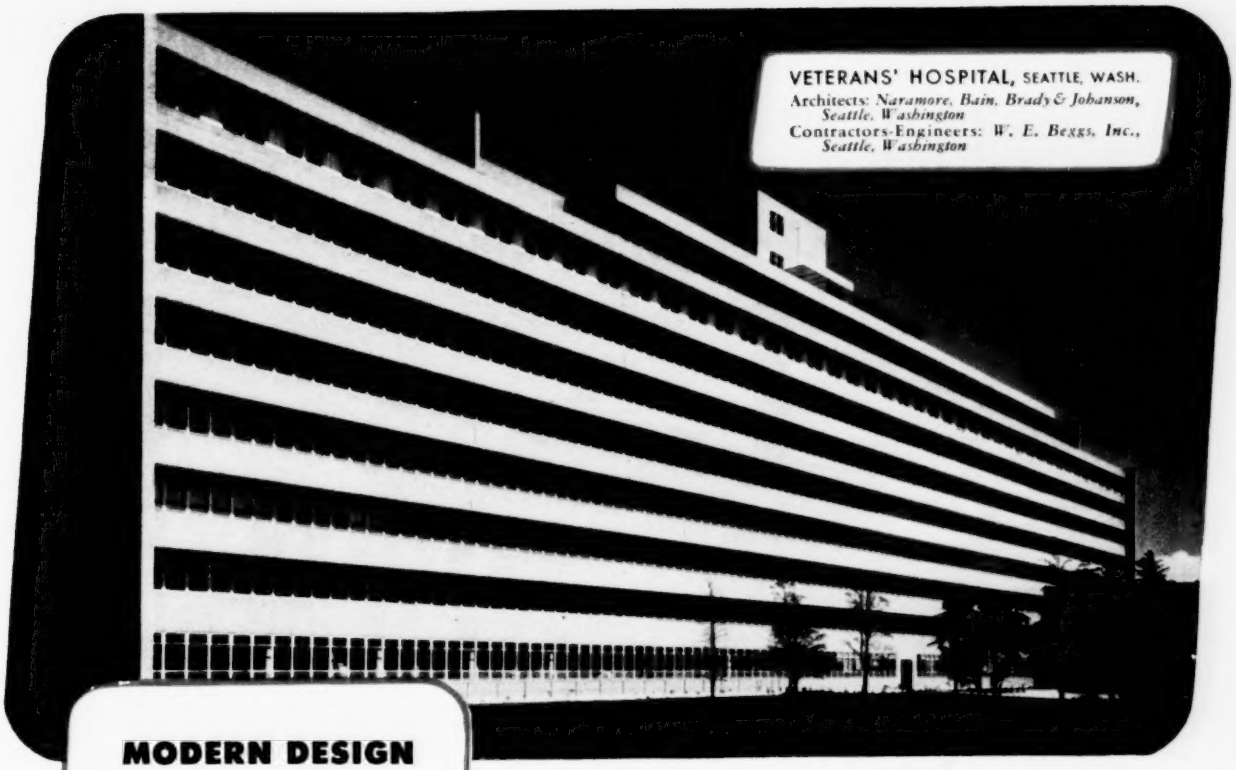
■ **ADJUSTABLE** . . . orifice valve can be simply set by wing nut for varied amount of air delivery. Individual panel adjustments do not disturb the overall balance of the system.

■ **COMPLETELY CONCEALED** . . . ANY STANDARD PERFORATED 12" x 24" ACOUSTICAL METAL CEILING PAN (supplied by the ceiling contractor) functions as the distribution plate for the MODULAR MULTI-VENT PANEL. The panel simply replaces the acoustical pad and nests snugly in the pan which snaps into ceiling tee runner, unhampered. Ceiling face is undisturbed.



MULTI-VENT DIVISION THE PYLE-NATIONAL COMPANY

Sales and Engineering Representatives in Principal Cities of United States and Canada 1374 North Kostner Ave. Chicago 51, Illinois


VETERANS' HOSPITAL, SEATTLE, WASH.
Architects: Naramore, Bain, Brady & Johanson, Seattle, Washington
Contractors-Engineers: W. E. Beggs, Inc., Seattle, Washington

MODERN DESIGN DESERVES *modern heating*

The excellent temperature control and operating economy which characterize B & G *Hydro-Flo* Heating are dictating the use of this forced hot water system in institutional, commercial and industrial buildings.

B & G *Hydro-Flo* Heating permits close control of the heat supply... the temperature of the water circulating through the system is *automatically* raised or lowered to meet varying temperature conditions. The advantages of this *variable* water temperature are two-fold: The discomforts of over and under-heating are avoided and fuel consumption is held to a minimum.

Zoning a B & G *Hydro-Flo* System makes possible a further refinement of temperature control. Different sections of a building can be maintained at temperatures best suited to their functions...or compensation can be made for the effects of wind, exposure or solar heat.

B & G *Hydro-Flo* equipment is mechanically simple—does not require critical adjustment or complex control devices.

Typical circulating and water heating equipment as used in larger installations of B & G Hydro-Flo Heating.

B & G *Hydro-Flo** Heating

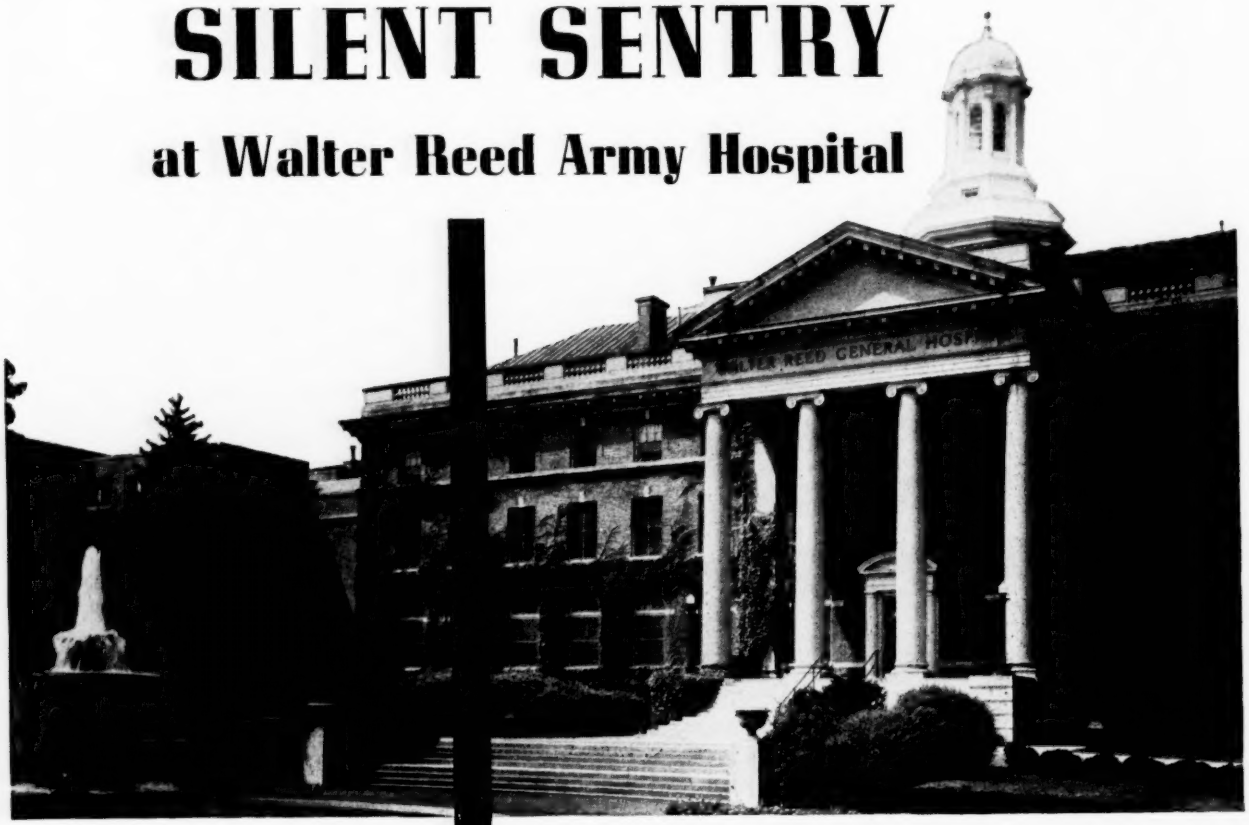
BELL & GOSSETT COMPANY

Dept. CZ-4, Morton Grove, Illinois

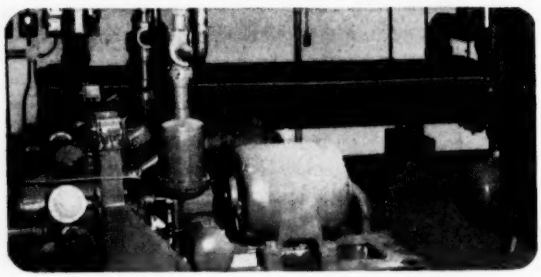
Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada

*Reg. U. S. Pat. Off.

The SILENT SENTRY at Walter Reed Army Hospital



The Acme Dry-Ex* Water Chiller installed at Walter Reed General Hospital as part of a central air conditioning system.



There's a silent sentry at Walter Reed General Hospital in Washington, D.C. who's been on constant 24-hour duty since December 1949. It's an Acme Dry-Ex Water Chiller, put there as part of an air conditioning system to guard the "comfort zone" and health of the Army patients under treatment.

This Acme Chiller quietly and efficiently supplies chilled water for the giant air conditioning system. Every minute 168 gallons of water course through the Acme Chiller to be readied for circulation through the rooms and wards of the hospital. Washington's hot and humid "dog days" are barred at the door by this Acme unit.

Performance of the Acme Dry-Ex has led to the selection of more Acme equipment for the hospital. The most recent is 9 Hi-Peak* Water Coolers to serve as centrally located drinking water coolers in various buildings.

*Trade Mark

ACME INDUSTRIES, INC.

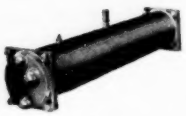
JACKSON, MICHIGAN

Mfgs. of a complete line of Air Conditioning and Refrigeration Equipment

Evaporative Condensers
Cooling Towers
Floor-type Unit Coolers

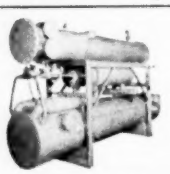
Direct Expansion (Dry-Ex) and Flooded Liquid Chillers

Heat Exchangers, Oil Separators



Shell and Tube, Shell and Coil Condensers

Receivers, Pipe Coils



Packaged Liquid Chillers to 225 tons

Flow-Temp Heat Pumps

Flow-Cold Liquid Chillers

Remote Room Conditioner

Continuously serving the refrigeration and air conditioning industry since 1919

COPELAMETIC

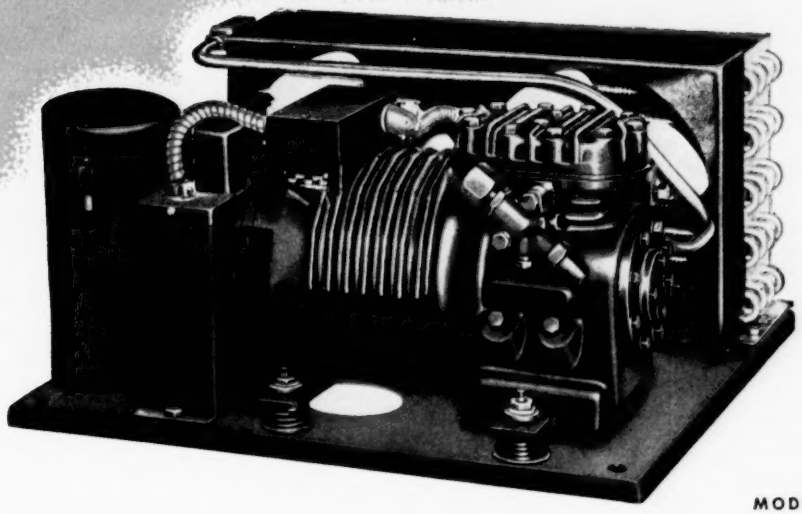
THE *Accessible* HERMETIC

compact . . . dependable . . . quiet . . .

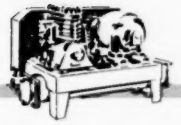
Compact . . . dependable . . . quiet. Those are the prime requirements for the refrigeration unit in any air conditioning system. Add to them ruggedness, accessibility and long life and you have the COPELAMETIC.

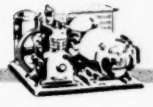
For the unit that has everything, look to Copeland the pioneer. Practical-minded engineers designed this modern unit without belts, seals or manual oiling, and to top that they made it accessible for servicing on the spot. Specify COPELAMETIC and be sure of a satisfied client for years to come.

There's a Copeland unit for every type air conditioning installation from smallest to largest. Air-cooled, remote COPELAMETICS are made from 1/4 thru 3 HP. There are water-cooled, remote units from 1/3 thru 7-1/2 HP. Self-contained COPELAMETICS are available for all applications. For complete details, write us or call your refrigeration dealer.



MODEL DE-100 ILLUSTRATED





REFRIGERATION UNITS (OPEN TYPE AND COPELAMETIC) WATER COOLERS

Copeland

DEPENDABLE *Electric* REFRIGERATION

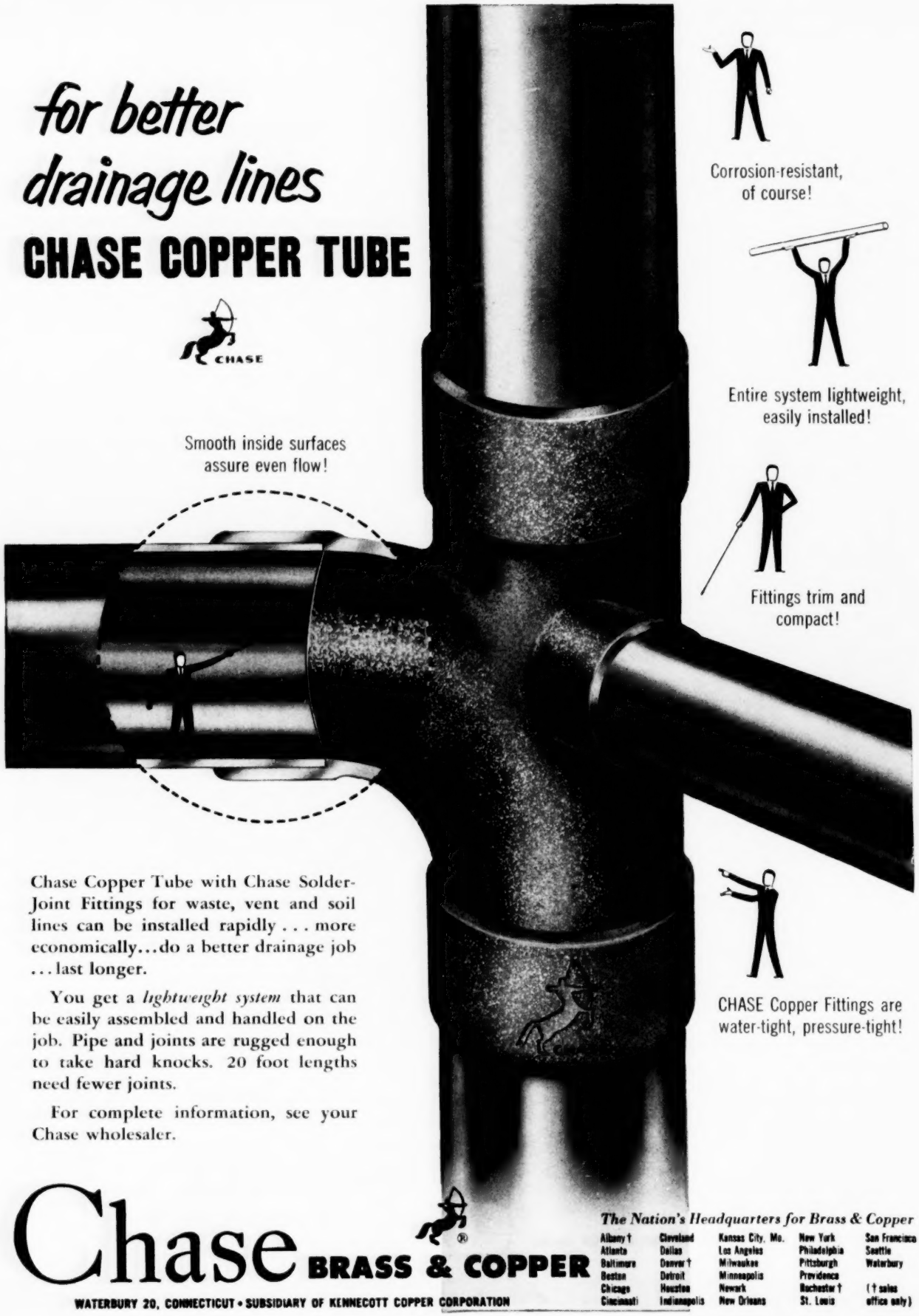
COPELAND REFRIGERATION CORPORATION • SIDNEY, OHIO

for better drainage lines

CHASE COPPER TUBE

CHASE

Smooth inside surfaces assure even flow!



Corrosion-resistant, of course!

Entire system lightweight, easily installed!

Fittings trim and compact!

CHASE Copper Fittings are water-tight, pressure-tight!

Chase Copper Tube with Chase Solder-Joint Fittings for waste, vent and soil lines can be installed rapidly . . . more economically...do a better drainage job . . . last longer.

You get a *lightweight system* that can be easily assembled and handled on the job. Pipe and joints are rugged enough to take hard knocks. 20 foot lengths need fewer joints.

For complete information, see your Chase wholesaler.

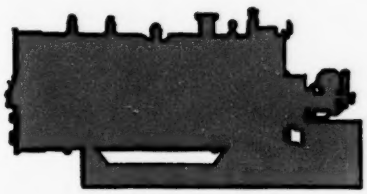
Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

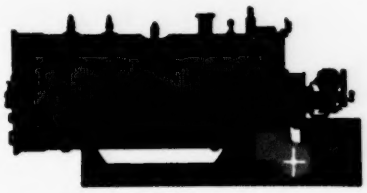
Albany †	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver †	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston	Newark	Rochester †	(† sales office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	

HOW SUPERIOR SOLVES YOUR STEAM PROBLEMS



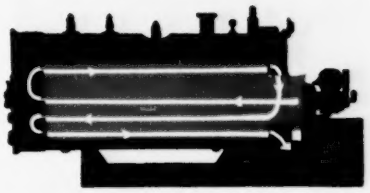
A COMPLETE PACKAGE

Completely factory-assembled and tested, a Superior Steam Generator is backed by undivided responsibility.



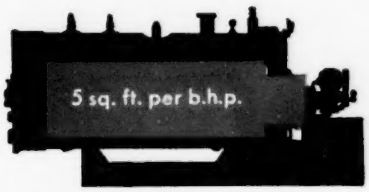
INDUCED DRAFT THAT'S BUILT-IN

... eliminates need of an expensive chimney ... Multiple fans draw evenly on all tubes, reducing maintenance.



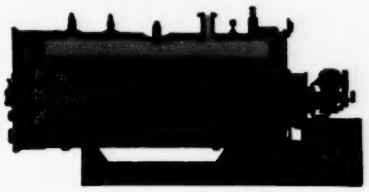
4-PASS, DOWN-DRAFT DESIGN

High gas velocities produce high efficiency. Down-draft design promotes rapid evaporation, quicker steaming.



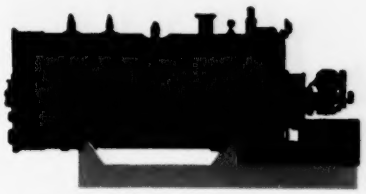
AMPLE HEATING SURFACE

A minimum of 5 sq. ft. of heating surface per boiler horsepower assures maximum efficiency at full rated capacity.



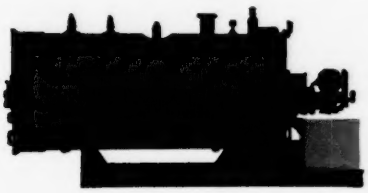
RESERVE CAPACITY

Greater steam space and large evaporating surface provide ample reserve capacity & better than 99% dry steam.



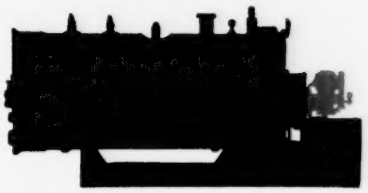
NO EXPENSIVE FOUNDATION

Built on a rigid channel iron base, a Superior Steam Generator needs only a floor capable of supporting its weight.



BUILT-IN CONTROLS

All controls essential to completely automatic operation are factory-wired into an easily accessible control panel.



BURN OIL, GAS, OR BOTH

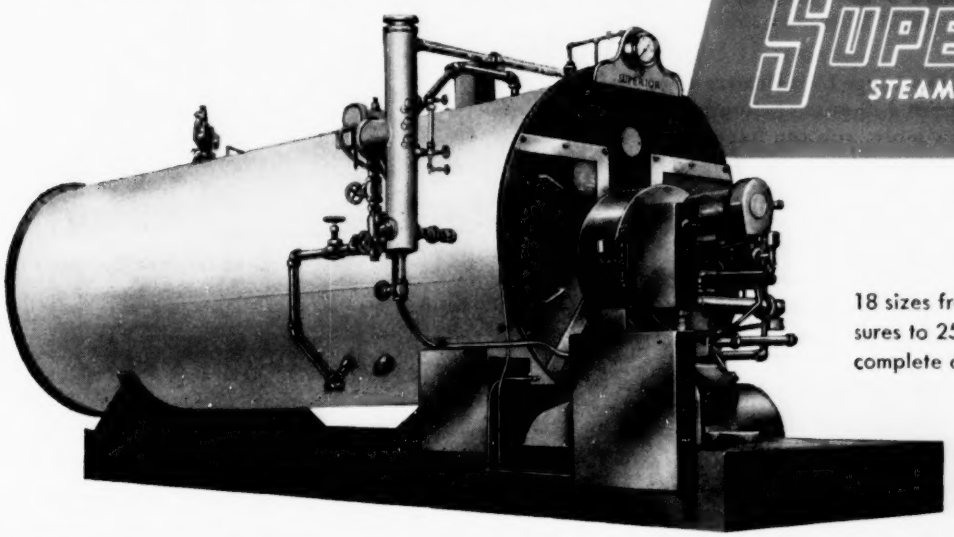
Superior Burners burn oil or gas or a combination of both ... changing from one fuel to the other in seconds.

Superior Steam Generators are the ideal choice for a new steam plant ... the simplest answer to expanding your present plant ... the easiest solution to replacing obsolete boilers.

Guaranteed to develop maximum rated capacities at thermal efficiencies in excess of 80%, their design embodies features which insure long-lived dependability and maximum fuel economy.

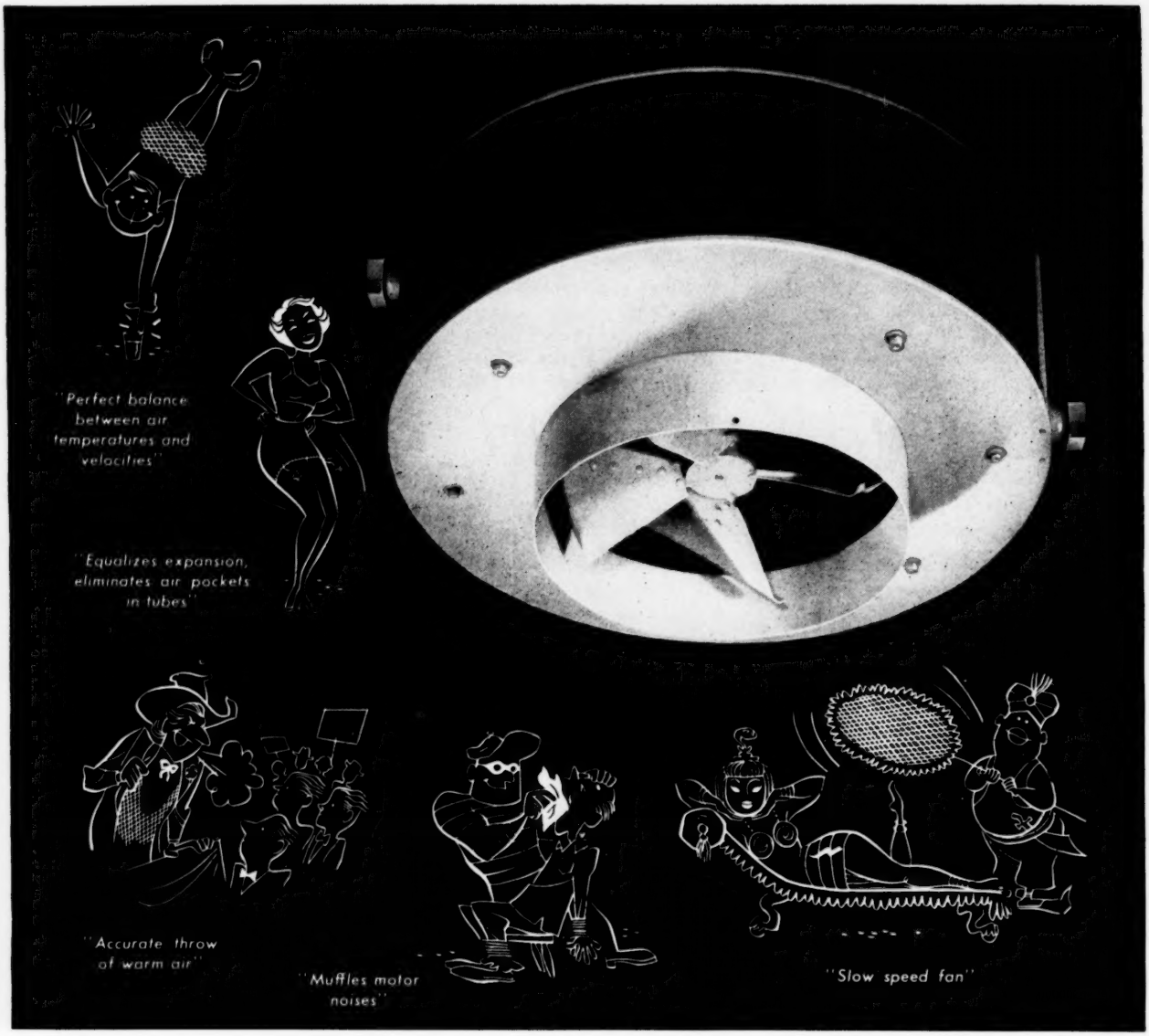
for performance you can **BANK** *on*

SUPERIOR
STEAM GENERATORS



18 sizes from 20 to 600 b.h.p. for pressures to 250 p.s.i. or for hot water. For complete details write for Catalog 519.

SUPERIOR COMBUSTION INDUSTRIES INC. TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.


"Perfect balance between air temperatures and velocities"
"Equalizes expansion, eliminates air pockets in tubes"
"Accurate throw of warm air"
"Muffles motor noises"
"Slow speed fan"

How To Solve Your Space Heating Problems

Put in Dunham Vertical Discharge Unit Heaters and get *all* the warm air you need, *where* you need it, at temperatures that are never too low or too high. What's more, you can hang this heater in a few minutes—without putting any "support strain" on piping.

Maintenance costs are low, too. Vibration, excessive heat and dust can't get to and affect Dunham's slow speed motor. And Dunham's improved header design reduces number of solder joints, eliminates air pockets in tubing.

Dunham Unit Heaters have many other design and performance points you'll want to check. Why not check the easy way? Write for details today.

Send for Free Bulletin

Bulletin 1301-16 tells how sturdy, longer lasting Dunham Unit Heaters can solve your space heating problems. Full data on sizes, construction, capacities. For your free copy please write: C. A. Dunham Company, 400 W. Madison Street, Chicago 6, Illinois.

DUNHAM UNIT HEATERS

DUNHAM 1903-1953 *Quality first for fifty years*

ANOTHER QUALITY PRODUCT OF C. A. DUNHAM COMPANY—CHICAGO • TORONTO • LONDON

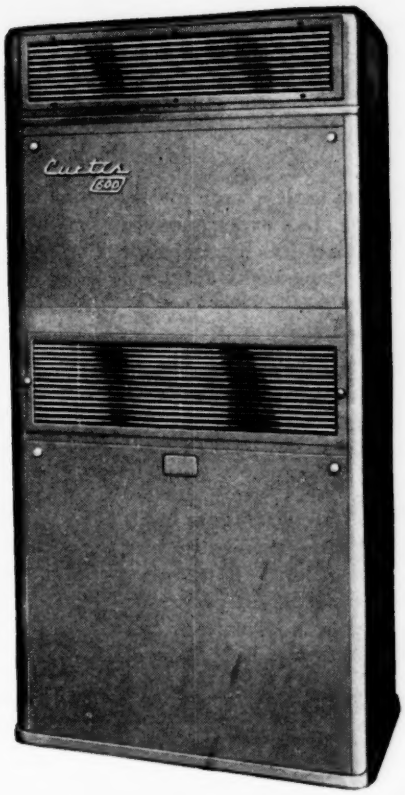
YOU PROFIT BY

Curtis EXPERIENCE

in 15 years

of Packaged Air Conditioning Pioneering

One of the First in the Industry



Curtis units that were installed back in the days when packaged air conditioning was a novelty are still giving faultless service. Today's Curtis packaged units are better than ever . . . perfected by 15 years of experience.

YOU'LL SELL more packaged units when you sell these Curtis advantages:

- Long life, slow speed operation
- Quiet and dependable
- 5 year warranty
- Easy installation
- Attractive, modern appearance
- Complete range of sizes — 2, 3, 5, 7½, 10 and 15 tons

Nationally Advertised in THE SATURDAY EVENING POST, TIME and NEWSWEEK.

For Full Information
MAIL THIS COUPON — WITH YOUR LETTERHEAD

748

CURTIS REFRIGERATING MACHINE DIVISION
of Curtis Manufacturing Company
1999 Kienlen Avenue, St. Louis 20, Missouri

I am interested in direct factory franchise. Send complete details.

Company Name.....

Street.....

City..... Zone..... State.....

Signed.....

CURTIS REFRIGERATING MACHINE DIVISION
of Curtis Manufacturing Company (Since 1854)
Kienlen Avenue • St. Louis 20, Mo.

There's a lot we don't know about air filters!

FOR 28 YEARS we've been engineering air filters to do a wide variety of filtering jobs. We've learned plenty from this experience. In fact, we think we know as much about air filtration as the next fellow—maybe more. But still we realize that there's a lot we *don't* know about air filters.

For instance, one thing we admit that we can't do is design a "universal" filter that will answer every filtering requirement. And we don't think anyone else can either. You can't get around the fact that every air filter design involves compromise. No one filter can give you the optimum of all factors such as efficiency, pressure drop, cost, face velocity and dirt-holding capacity.

This is why Air-Maze offers a *wide selection* of filter types, each engineered to provide the maximum performance for a particular combination of operating conditions. Each type has been thoroughly field-proved in many installations throughout the country. Each type is all metal—cleanable—permanent. For complete information, call your nearby Air-Maze representative or write Air-Maze Corporation, 25000 Miles Avenue, Cleveland 28, Ohio.

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SILENCERS
SPARK ARRESTERS

AIR-MAZE
The Filter Engineers

LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

There are McDONNELL SAFETY CONTROLS for each of your FOUR MAJOR MARKETS

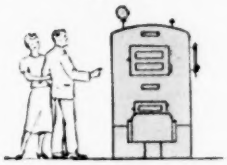
The market for McDonnell boiler safety devices is as simple as this. All prospects fall into four clear-cut groups. Each group is covered by the products listed here. Ask for latest data.

McDONNELL & MILLER, INC., 3500 N. Spaulding Ave., Chicago 18, Ill.

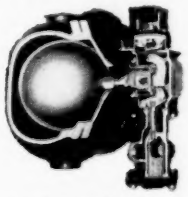
Doing One Thing Well

Have Jobber Send Them

1
for steam heating boilers



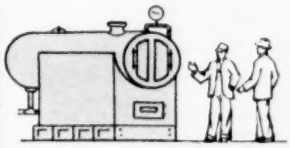
No. 47-2 **Combined Boiler Water Feeder and Low WaterCut-off.** Covers the largest class of automatically fired steam boilers: below 5000 sq. ft. capacity; maximum steam pressure 25 lbs. Feeder maintains safe water level; cut-off switch stands by for emergency . . . giving both mechanical and electrical protection. No. 47 (without cut-off) is for hand fired boilers of this class.



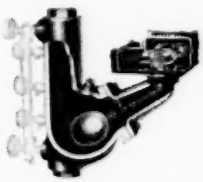
No. 51-2 **Combined Boiler Water Feeder and Low Water Cut-off**—For boilers larger than 5000 sq. ft. capacity; maximum pressure 35 lbs. Functions same as No. 47-2. No. 51 (without switch) for the larger hand fired boilers.

No. 67 **Low Water Cut-off.**—Covers the low water cut-off requirements of all steam heating boilers, maximum pressure, 20 lbs.

2
for high pressure steam boilers



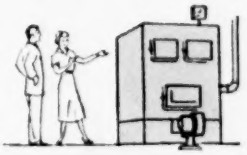
No. 150 **Pump Control, Low Water Cut-off, and Alarm** — For steam boilers with pressures of 150 lbs., maximum. Provides means of controlling feed pump directly from water line . . . best method for high pressure jobs. Also provides low water fuel cut-off and low water alarm when desired.

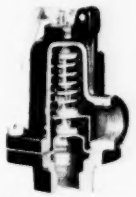


No. 157 **Pump Control Low Water Cut-off and Alarm**—Exactly same as No. 150 in operation, but has integral water column which greatly simplifies installation on boilers with independent water columns.

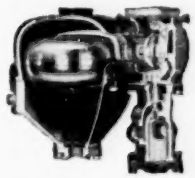
No. 27 **Make-up Water Feeder**—Perfect team-mate for No. 150 or 157. Supplies make-up to maintain required water level in receiving tank. Types available for all conditions.

3
for hot water space heating boilers

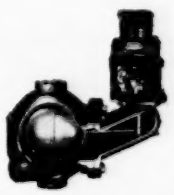




No. 230-30 **Pressure Relief Valve.** Maximum protection against excess pressure is the foremost requirement of a hot water heating boiler. This is assured by the Btu-rated Series 230. Conforms to all ASME Boiler Code requirements. Tested and rated by National Board.



No. 247 **Boiler Water Feeder** — Used on residential sized 30 lb. ASME Hot Water Boilers in keeping with modern practice of maintaining safe water level. Teams with relief valve to protect hot water system.



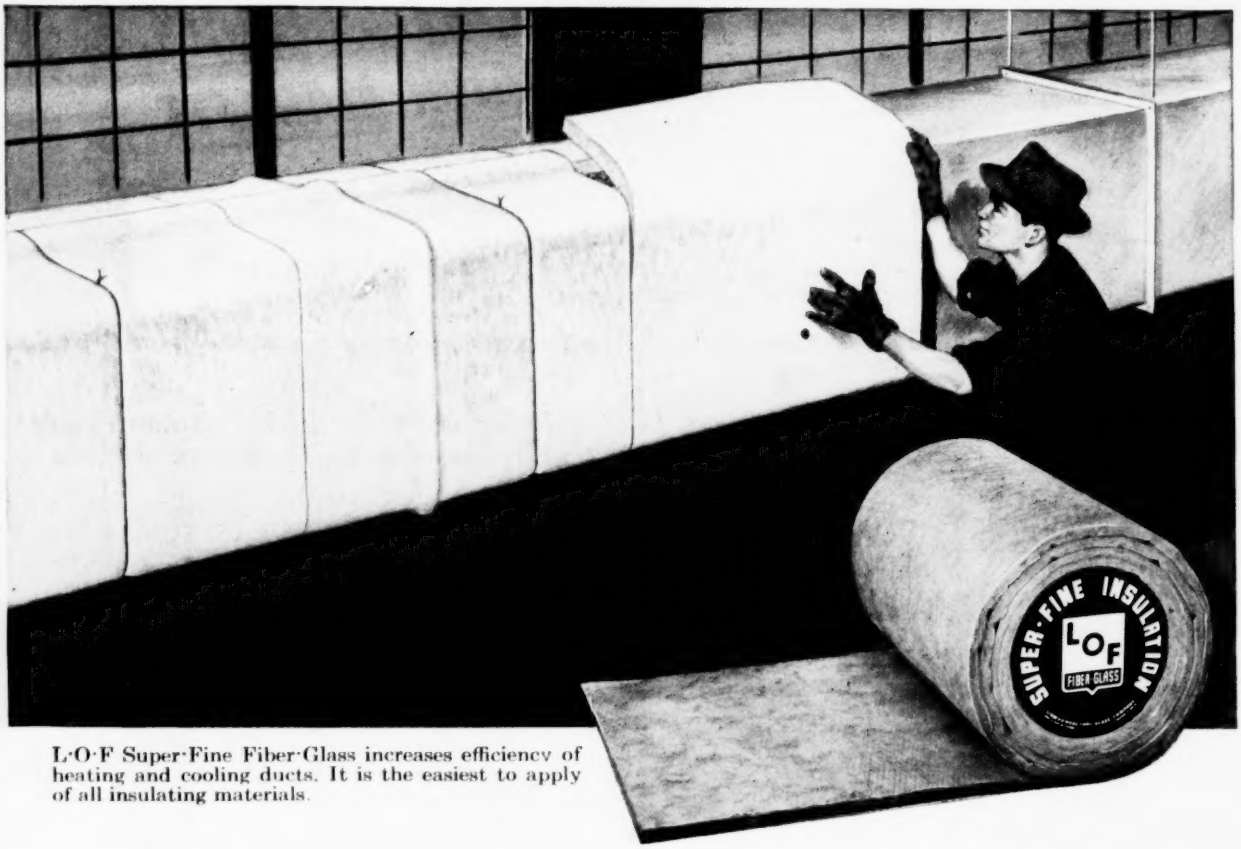
No. 63 **Low Water Fuel Cut-off**—Specially designed for hot water heating boilers; for pressures up to 50 lbs. Stops burner in event of emergencies such as leaks, prolonged discharge of relief valves, etc.

4
for hot water supply heaters and tanks

No. 202 **Series Combined Temperature and Pressure Relief Valve** — Best valve for guarding against twin hazards of excessive pressure and temperature. Pressure and temperature relieving capacities are Btu-rated assuring maximum protection. Series covers all opening pressures.

No. 201 **Temperature Relief Valve**—The temperature mechanism used in the No. 202 . . . for application where temperature relief alone is required.

No. 230-75 **Series High Pressure Relief Valves** — Btu rated pressure relief valves complying with ASME boiler code. Mechanism is same as pressure side of No. 202 T & P. Factory settings 75, 100, 125, 150 lbs.



L·O·F Super·Fine Fiber·Glass increases efficiency of heating and cooling ducts. It is the easiest to apply of all insulating materials.

Boost efficiency of your duct installations with L·O·F Fiber·Glass

Increase the over-all efficiency of your cooling and heating duct installations with L·O·F Super·Fine Fiber·Glass insulation. These lightweight blankets surpass other types of fibrous insulation for resistance to heat flow.

As heating duct insulation, Super·Fine Fiber·Glass reduces heat losses and saves fuel. On cooling ducts it saves power and permits use of smaller units. Applied to the inside of either type duct, coated L·O·F Super·Fine Fiber·Glass muffles noise. It reduces condensation on air conditioning ducts and the glass fibers will not absorb moisture. Super·Fine Fiber·Glass can be used for temperature ranges from sub-zero to 400 degrees F.

Super·Fine Fiber·Glass is lightweight and is easily fabricated and installed by one man. It requires no pre-processing to various diameters and shapes. Super·Fine takes the conformation desired as it is installed. It can be applied to either round or rectangular ducts and adds very little weight to the installation.

For more information contact the nearest L·O·F office (offices in 26 major cities). Or write Libbey·Owens·Ford Glass Co., Fiber·Glass Division, 3163 Wayne Building, Toledo 3, Ohio.

LOF GLASS PLASKON FIBER-GLASS

LIBBEY·OWENS·FORD GLASS COMPANY
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FIBER·GLASS

Remember the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.

Engineered for tough service

THIS TUBE-TURN Welding Neck Flange will contain greater pressures under temperature extremes, and will last longer than other types under repeated bending or vibrations of piping. It is *engineered* for tough service . . . with a long, tapered hub, and a smooth transition in thickness to the pipe-end bevel.

You can select the exact Welding Flanges you require from TUBE TURN's complete line: welding neck; slip-on; lap joint; socket welding; blind; orifice; or pipeline non-standard flanges. It *pays to specify* TUBE-TURN Welding Fittings and Flanges. Call your nearby TUBE TURNS' Distributor . . . you'll find one in every principal city.

Be sure you see the double "tt"

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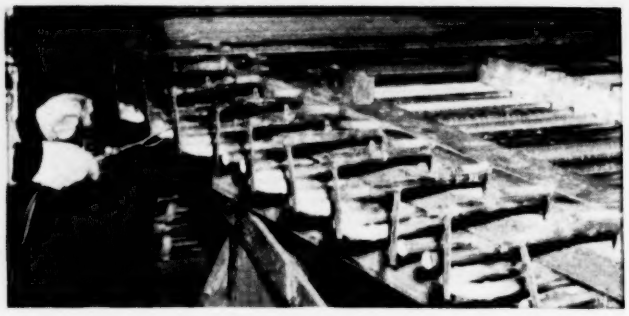
TUBE TURNS' *Engineering Service* HELPS DEVELOP NEW PIPING TECHNIQUE

D. R. Cheyney, of TUBE TURNS' Engineering Service Division, has had wide experience in alloy and non-ferrous applications.

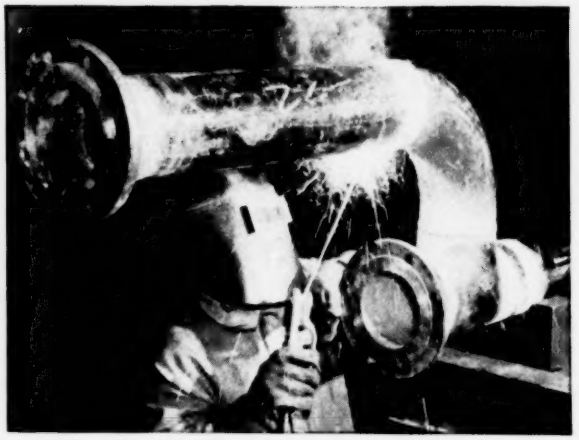
THIS STORY of how a large processor saved $50,000 and conserved scarce copper with a new approach to a piping application shows why TUBE TURNS, INC. is so highly regarded as an authority on piping engineering.

The problem involved the retubing of seven cooling units, formerly fabricated from copper tubing and fittings. Aluminum was considered as a replacement; however, there were no satisfactory methods for welding thin-walled aluminum tubing to welding fittings. TUBE TURNS' Engineering Service Division, working with Alcoa, came up with the solution. A new brazing technique was developed, and special TUBE-TURN Welding Returns, and TUBE-TURN Welding Elbows were supplied.

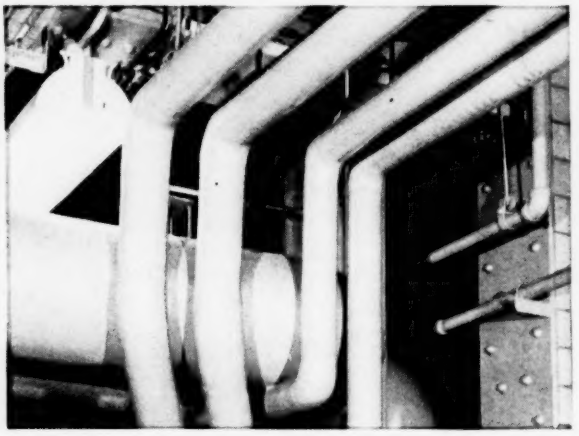
TUBE TURNS' Engineering Service is ready to help *you* in such special applications.



TUBE-TURN aluminum long-radius Welding Returns being brazed to aluminum tubing, in fabrication of cooling coils.



SPEEDS FABRICATION—TUBE-TURN Welding Fittings have won a reputation for dimensional accuracy that pays off in fast, easy alignment and fabrication. Time often is saved by welding assemblies in the shop, quickly tying them into the job.



SPACE SAVER—Welded piping makes a compact, neat installation—and requires no maintenance. Streamlined, its insulation is more easily applied.

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LOUISVILLE 1, KENTUCKY

TUBE TURNS, INC., Dept. B-6
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Your name .....
Position .....
Company .....
Nature of Business .....
Address .....
City ..... *State* .....

Brotherhood of Boilermakers Office Building,
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Architect:
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MORE AND MORE smart, modern buildings are being equipped with Kno-Draft Adjustable Air Diffusers. The advantages are many—

BEAUTY: Whether left in their natural aluminum finish or painted to match the ceiling, Kno-Draft Adjustable Air Diffusers harmonize with any architectural or decorative style.

EFFICIENCY: With Kno-Draft Adjustable Air Diffusers, you can set and maintain the exact volume and flow pattern of the air—warm or cool—needed to assure the comfort of *uniform temperature without drafts* throughout the conditioned area.

SIMPLICITY: The post-installation adjustability feature of Kno-Draft Air Diffusers means less "engineering" for you. It also assures flexibility to meet possible future layout changes.

COMPLETENESS: There is a complete line of Kno-Draft Adjustable Air Diffusers—types and sizes to meet all engineering and architectural requirements.

You should have on file the *new edition* of the Kno-Draft Data Book—complete up-to-date specifications, engineering and installation data on Kno-Draft Adjustable Air Diffusers. Free on request. Mail the coupon or write for your copy to: Connor Engineering Corporation, Danbury, Connecticut.

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adjustable air diffusers

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Please send me the *new edition* of the Kno-Draft Data Book—without obligation, of course.

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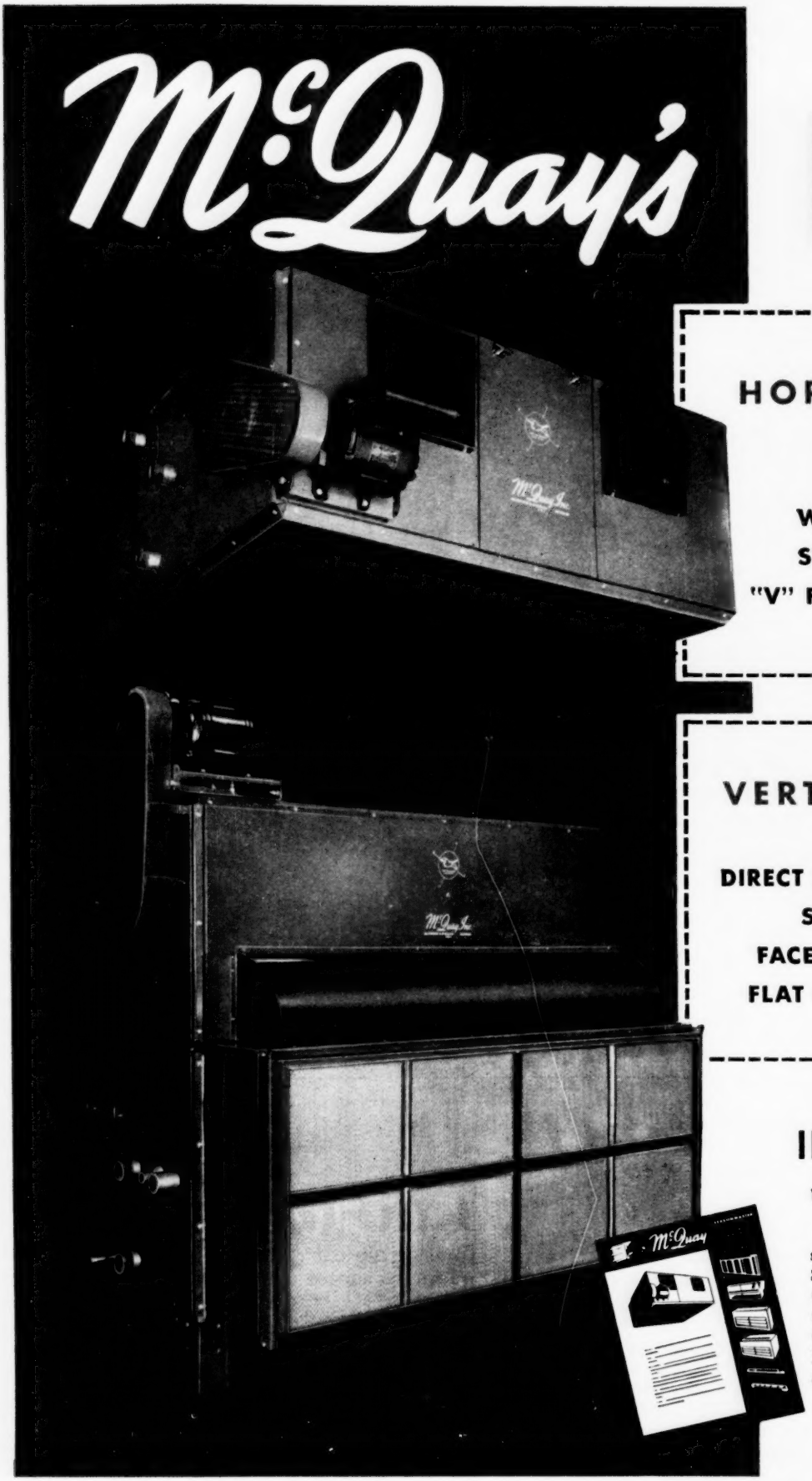
Position.....

Company.....

Street.....

City..... **Zone**..... **State**.....

McQuay's NEW



HORIZONTAL UNIT

WITH

WATER COIL

STEAM COIL

"V" FILTER SECTION

VERTICAL UNIT

WITH

DIRECT EXPANSION COIL

STEAM COIL

FACE AND BY-PASS

FLAT FILTER SECTION

IN 14 MODELS!

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For complete features and specifications of McQuay's new Seasonmaster get your copy of Catalog No. 505. Representatives in all principal cities. Or write McQuay, Inc., 1619 Broadway St., N. E., Minneapolis 13, Minnesota.

SEASONMASTERS

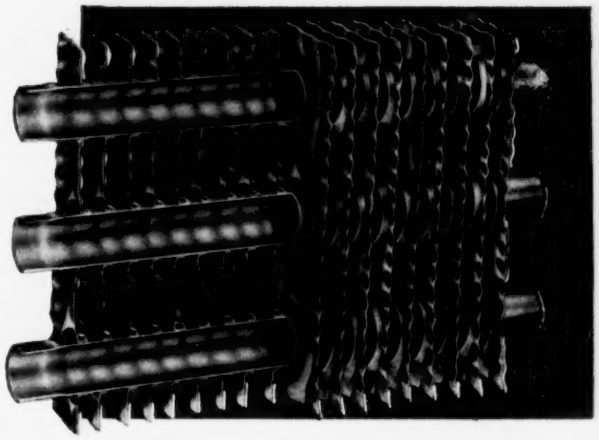
...everything you've wanted in Central Station Air Conditioners!

You've never seen a central station air conditioner that does so much, so well, under such a wide variety of conditions as McQuay's *new* Seasonmaster.

Fourteen models, in both horizontal and vertical types, many combinations of cooling and heating coils, a wide variety of accessories give you a unit adaptable to all year 'round demands . . . cooling and dehumidification, heating and humidification, positive ventilation, and air filtering.

Seasonmasters are furnished with ½" rigid insulation and are available with various air discharge arrangements. All parts are readily accessible for ease of installation and service.

McQuay construction of these versatile units is your assurance of quality and dependability. All coils are made with the exclusive McQuay Ripple-Fin construction for unmatched heat transfer efficiency. Seamless copper tubes are expanded into wide, smooth collars of aluminum fins. Headers are heavy wall, seamless copper tubes. In common with all McQuay products, the Seasonmaster was perfected after long and careful study, to give you maximum performance and trouble-free service.



NOW...THE MOST UNIVERSAL LINE IN THE INDUSTRY!

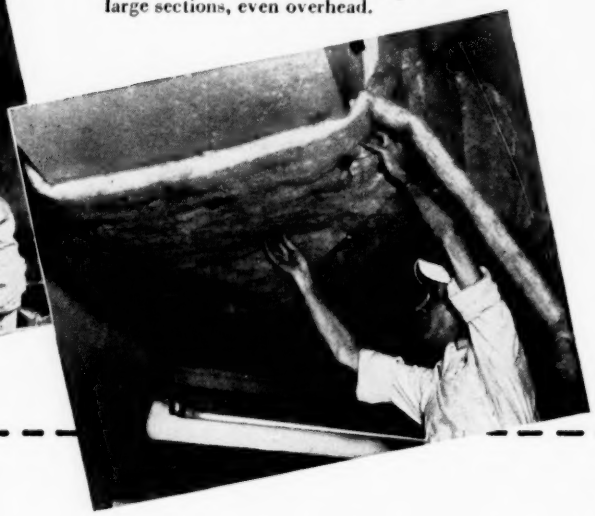
Seasonmaster's wide range of Cfm and Btu capacities . . . its many practical combinations of coils and accessories add up to the most universal line of air conditioners in the industry. For air conditioning that will solve the problem to the complete satisfaction of both you and your customers, specify McQuay.

McQuay INC.

HEATING
AIR CONDITIONING
REFRIGERATION

Flexible MICROLITE blanket conforms readily to irregular shapes.

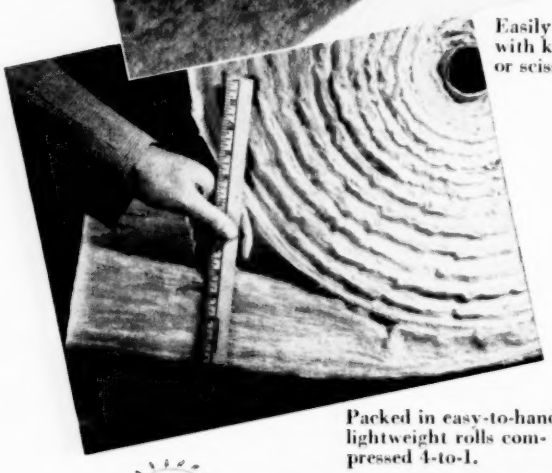
Extremely light in weight with good tensile strength for easy handling in large sections, even overhead.



When you've got ducts to wrap...

You'll save time— You'll do it easiest— with MICROLITE

Easily cut with knife or scissors.



Packed in easy-to-handle, lightweight rolls compressed 4-to-1.

MICROLITE ***Glass Fiber Insulating Wool*** is a natural for wrapping ducts. It's soft—it's resilient—it's pleasant to handle—it's easy to cut.

Extreme light weight of Microlite minimizes attachment and mounting points—without danger of insulation sag. Weighing only ½-pound per cubic foot, enough B-305 Microlite to provide 1″ of insulation on a 1′ x 2′ x 100′ duct weighs only 50 pounds.

Inch for inch, Microlite is one of the most effective of all insulating materials. Half-pound density Microlite has a "k" factor of .25 at 50° mean; a Noise Reduction Coefficient for 1″ thickness of .60. You can't conscientiously proceed with any insulating job until you've investigated Microlite, a product of Glass Fibers exclusive electronic-extrusion process. Write for descriptive Microlite brochure and detailed duct application manual. Glass Fibers Inc., 1810 Madison Avenue, Toledo 2, Ohio.

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Makers of glass fibers by the ELECTRONIC-EXTRUSION process—developed, patented and used exclusively by Glass Fibers Inc.

VITRON Yarns • Rovings • Micro-Fibers • Pipe Wraps • Industrial Mats • MICROLITE Thermal and Acoustical Insulation
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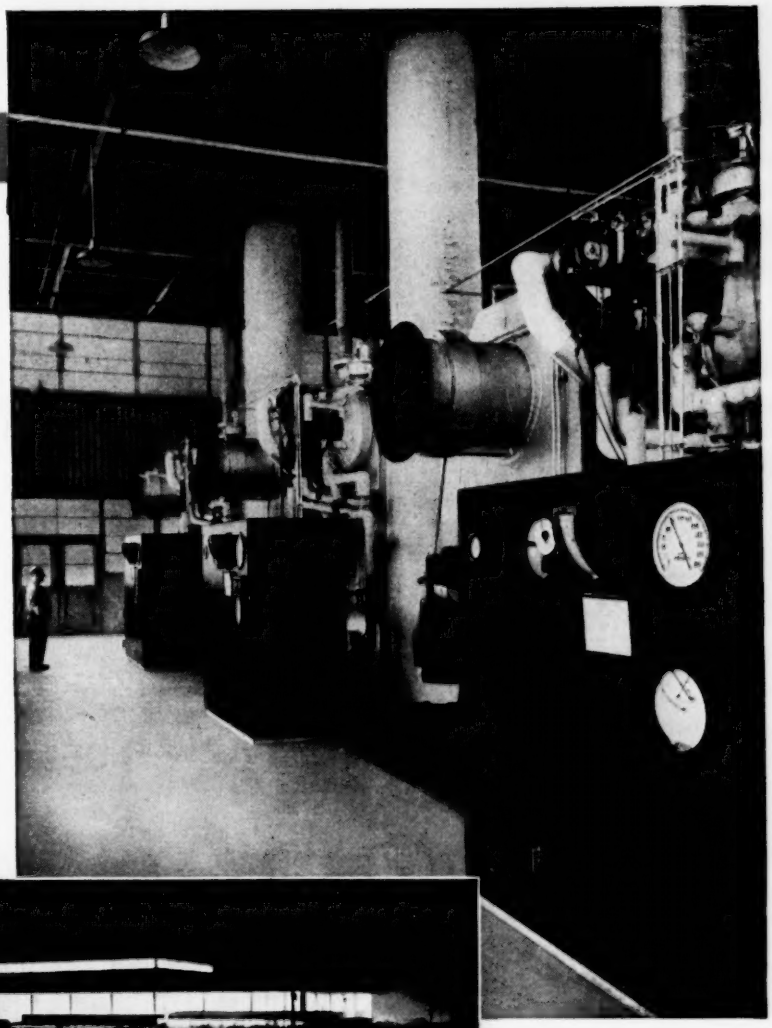
keeping steam cheap . . .

with a multiple-unit installation

at

WHITE LABORATORIES, INC.



Night view of new White Laboratories plant—
A. M. Kinney, Inc., Consulting Engineers,
Cincinnati, Ohio.

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Suitable for Outdoor Service
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

Installation of 3 B&W Integral-Furnace Boilers, Type FM, to serve the steam requirements of the large, modern plant of White Laboratories, Inc. at Kenilworth, N. J., is one more indication of the industry-wide acceptance trend now firmly established by these shop-assembled, B&W Units. Choice of this multiple-unit application of FM boilers instead of a single, larger unit, was decided on after careful consideration of all the factors involved in designing this new, expanded plant to provide a solution to White's continuing space problem. Each of these compact, versatile B&W Units is oil-fired by a B&W Y-Jet oil burner equipped with steam atomizer, and each is capable of producing 23,800 lb of steam per hr at pressures to 235 psi.

Combining the benefits of "package" steam with cost-saving big boiler advantages, B&W's Integral-Furnace Boiler, Type FM, has already been selected for a variety of companies covering more than 50 different industries as well as utilities and other users. B&W Units having a total steam capacity of more than 6½ million lb per hr are now in service or on order. Over half of this total capacity consists of multiple-unit installations. Available in standard sizes for loads ranging between 2900 and 28,000 lb per hr at steam pressures between 15 and 235 psi, this self-contained B&W steam generator is also obtainable for operation at higher pressures.

Send for Bulletin G-76 describing and illustrating the many cost-saving features of this popular boiler. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd St., New York 17, N. Y.

BABCOCK & WILCOX

G-594

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WHAT MORE COULD YOU ASK FOR THAN THIS?

- A complete line of industrial, commercial and residential oil burners
- Residential oil furnaces and boilers
- Compact units easily installed
- Highly salable equipment, with a famous name

WHICH ALL ADDS UP TO SATISFIED CUSTOMERS AND MORE PROFIT FOR YOU

Petro OIL BURNERS

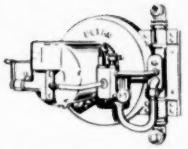
Mr. Heating Contractor, we can make your job easier and more profitable.

Petro has been building oil burners for over 50 years. The Petro line of oil firing equipment is outstanding. The Petro name is known and respected wherever oil burners and oil equipment is used. Petro dependability is traditional. The product has public acceptance.

Petro units are efficient fuel savers. They are simple and dependable in operation, require a minimum amount of service, and are a profitable line to sell.

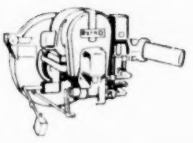
For illustrated literature and full information just write, Petro, 3194 W. 106th St., Cleveland 11, Ohio. In Canada, write 2231 Bloor St., Toronto, Ont.

Industrial, Commercial, Residential oil burners for every need



Industrial Oil Burners

Rotary type. Burn low-cost heavy fuel oil with complete reliability. Models for every industrial need. Capacities up to 200 gallons per hour.

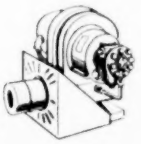


Combination Oil-Gas Burners

This commercial-industrial burner is the answer to seasonal fuel shortages. Makes possible advantages in economical fuel buying.

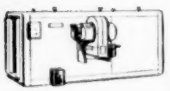
Residential Furnaces and Boilers

Made in popular sizes to fit the heating needs of homes of from 4 to 10 rooms. Extremely compact and attractive. Real fuel savers.



Conversion Units

Efficient, trouble-free oil burners for home and commercial use. Capacities up to 20 gallons per hour.



Horizontal Furnace

Hang it or hide it—this winter air conditioner fits anywhere. Available in 5 models from 80,000 to 180,000 Btu's (output at bonnet)

see our catalog in SWEET'S ARCHITECTURAL FILE or write for copy

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50 YEARS OF LEADERSHIP IN AUTOMATIC HEATING AND POWER EQUIPMENT

SPECIFY SPORLAN LMC and get PEAK PERFORMANCE on all Flooded Systems with the Sporlan LMC

Again Sporlan offers you a NEW FIRST!...

A Positive Liquid Level Control for Ammonia, Freon-12, and Freon-22 with all these features!

First, the Sporlan LMC consists of a standard Sporlan Thermostatic Expansion Valve equipped with a matched Sporlan Level Master Element. That means that the liquid level control and the expansion device are combined into one unit, and you have a choice of Sporlan Thermostatic Expansion Valves for Freon-12 and Ammonia up to 100 tons, and for Freon-22 up to 180 tons... *thus no job is too large or small for the Sporlan* **LMC.** *Existing flooded systems can be easily and economically modernized and made automatic with the Sporlan* **LMC.** *The Sporlan* **LMC** *provides a* MODULATED FLOW *and maintains practically a static liquid level in the low side! The Sporlan* **LMC** *insert bulb has* NO MOVING PARTS!

Any two wire power supply of 115 or 230 volts, any frequency AC or DC, is adequate. The Sporlan LMC insert bulb can be installed in either a horizontal, vertical or angle position for direct contact with the refrigerant. If the liquid level drops, a heater element in the bulb acts as an artificial superheat increasing the pressure in the thermostatic element, thereby opening the valve. If the liquid level rises, its refrigerating effect on the bulb overcomes the heater, and the valve throttles.

The Sporlan **LMC** *is* NOT *affected by turbulance... tight closing* IS *assured... there is no current flow through refrigerant... and only proven thermostatic expansion valve performance is employed!*

WRITE TODAY FOR COPY OF BULLETIN 60-15...
THEN SPECIFY SPORLAN LMC FOR ALL YOUR FLOODED JOBS!

Buy Sporlan Right Down the Line

SPORLAN VALVE COMPANY
7525 SUSSEX AVE. ST. LOUIS 17, MO.

EXPORT DEPARTMENT... 89 BROAD ST., NEW YORK 4, NEW YORK

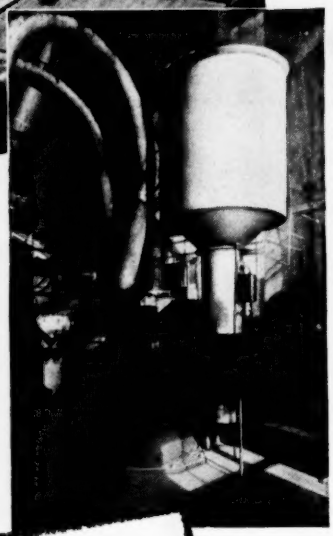
"How we save $20,000 a year—USING COAL INSTEAD OF OIL"

Louis G. Notte,
Chief Power Engineer,
Little Falls Laundry,
Little Falls, N. J.

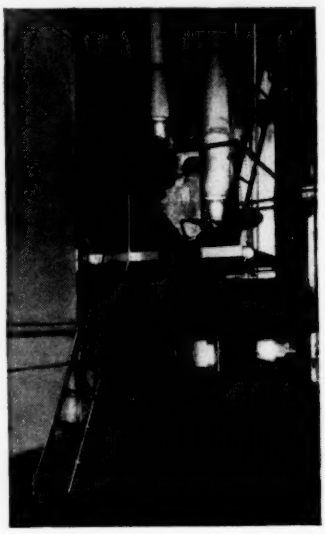
(ACTUAL CASE HISTORY OF THE LITTLE FALLS LAUNDRY, LITTLE FALLS, N. J.)

"Our laundry is one of the largest in the country," says Chief Power Plant Engineer Notte, "and, we think, one of the most progressive. Our company insists on superior performance at lowest possible cost all along the line. That's exactly why we depend on coal-fired equipment. From coal we get the daily amount of BTU's we need at a cost of $200—to get the same BTU's from oil would cost $280. We can change to oil on less than a day's notice—but so far we've *never* done it. Coal does a great job—cheaper."

To this plant in Little Falls 500 employees come to take care of the laundry for an estimated 100,000 people. And from this plant 100 trucks travel to customers across a 5,000 square-mile area! The laundry depends on coal to provide all electric power and lights—heat for all buildings—steam for hydraulically-operated machines—steam for pressers and dryers.



The pulverizer from which coal is blown into the boiler. Before this operation, the laundry employs a conveyor belt to feed a precrusher. From there, conveyors carry the coal to the 100-ton hopper which feeds the pulverizer. *Modern coal devices slash labor costs—make coal's basic economy even greater.*



A section of the modern coal-fired boiler. With equipment like this it's possible to add 10% to 40% to the power derived from the same amount of coal in years past—to bring over-all boiler efficiency to 85% or more.

If you're running your own steam plant, here are a few down-to-earth facts you don't want to miss!

COAL in most places, is today's most economical fuel.

COAL resources in America are adequate for all needs—for hundreds of years to come.

COAL production in the U. S. A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that American industry can count on more and more—for with modern combustion-and-handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

● Plants that use coal are in an enviable position—at the present *and* for the future. *For they are more certain than the users of other fuels of a dependable fuel supply—at stable prices.* The reasons are compelling. Of America's total fuel reserves, 92% is coal: Even today, oil is *imported* while this country can and does *export* coal. In addition—this country's mines are the most highly mechanized and efficient in the world.

To get *all* the great economy that coal is capable of delivering—to find out how much more efficient and dependable a job coal and the very latest coal-fired equipment can do—call in a competent consulting engineer. He'll recommend the right equipment for your specific needs. Then you'll see exactly why coal *on a performance basis, on a dollars-and-cents basis . . .* is your best fuel buy, by far!

BITUMINOUS COAL INSTITUTE
A Department of National Coal Association, Washington, D. C.

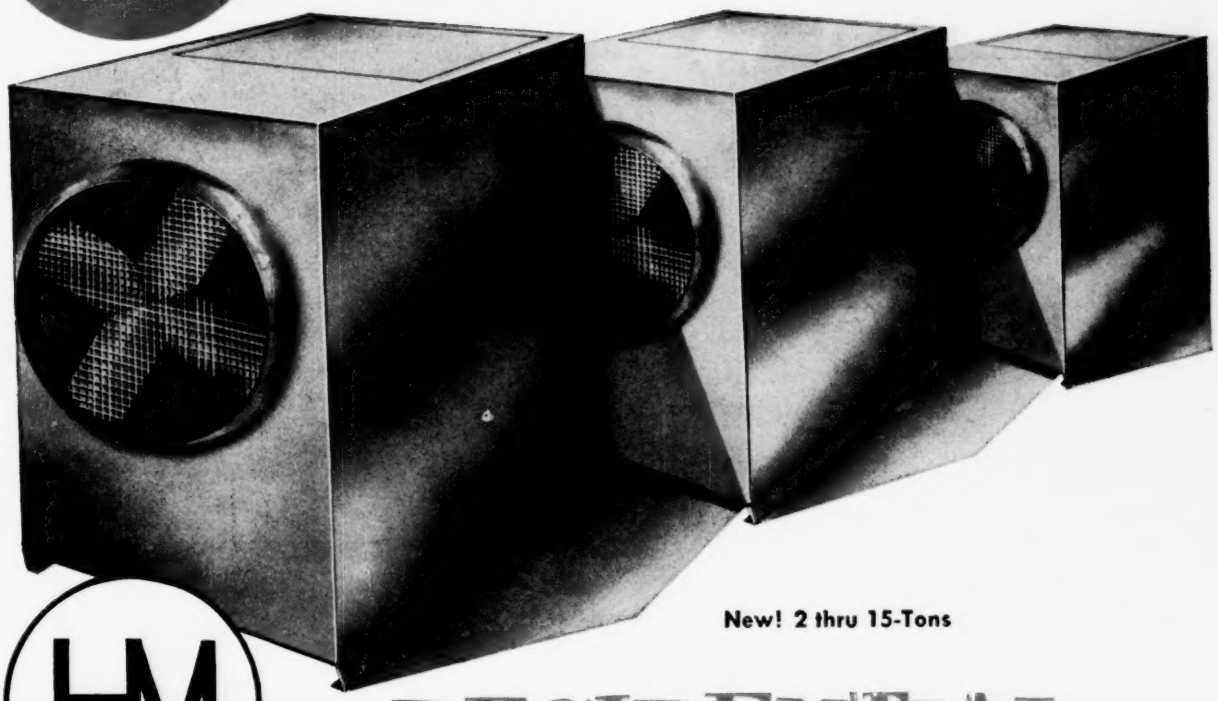
FOR HIGH EFFICIENCY FOR LOW COST

YOU CAN COUNT ON COAL!

ANOTHER HALSTEAD & MITCHELL FIRST

20-Year Guarantee!

ON THE WETTED DECK SURFACE



New! 2 thru 15-Tons

HM

RESIDENTIAL COOLING TOWERS

PRICED FOR THE HOME MARKET

Price-wise these Halstead & Mitchell Residential Cooling Towers throw open huge segments of the home and small building market to air-conditioning. Here is the development for which the industry has been waiting. Check prices today!

NOW REQUIRED IN MANY AREAS

Residential Cooling Towers recirculate precious water . . . meet requirements of municipalities which prohibit wasting cooling water to sewers. And low cost H&M units take residential air conditioning to the suburbs and rural area . . . recirculate from a cistern if need be!

MADE FOR REAL OPERATING ECONOMY

Economical, lastworthy . . . low operating cost matches low initial cost. Efficient gravity-type distributing pan eliminates windage loss since atomizing by spray nozzle is unnecessary. Low pump head pressure is another bonus of gravity distribution. And maintenance is a snap!

FAMOUS HALSTEAD & MITCHELL QUALITY

Here's *all* the quality for which Halstead & Mitchell Cooling Towers are world famous — including the 20-year Guarantee on the wetted deck surface of pressure-treated creosoted wood, against attack by rotting or fungi growth. Stainless steel fans and shafts, plus individual cabinet coatings of Vinsynite, Vinyl Zinc and chlorinated rubber add important years of life. The complete assembly is with Everdur bolts . . . disassembly is easy even after years of service.

AT LEADING WHOLESALERS EVERYWHERE

Write for descriptive bulletin from Halstead & Mitchell, one of the world's largest manufacturers of water-cooled Cleanable Condensers, and Cooling Towers up through 100-tons.

HM Halstead & Mitchell

OFFICES: BESSEMER BUILDING • PITTSBURGH 22, PA.

The New Louisiana Purchase

EVERY day America crosses a frontier—the frontier of a new market. It is the market created by an ever growing population. Since Pearl Harbor, our population has increased 23½ millions—more than all the people now living in the region west of the Mississippi once called the Louisiana purchase, that vast billion-acre area which provided us with geographical frontiers for a hundred years.

During 1952, 8,500 babies were born daily, increasing our population by nearly 3,000,000 people. New families and bigger families need more and bigger houses, more food, clothing, cars, roads, hospitals, churches, schools. Their needs call for continuing and increasing production from farms and factories.

There are those among us who say a decline in government spending will bring depression. But where is there room for depression when we add the population of another Minnesota or an Iowa to our nation each year—when the need for goods and services increases steadily? In fact, only by tapering off our vast programs of government spending can industry and business hope to provide sufficient goods to maintain our present standard of living and satisfy the demands of our ever growing population.

Let no one tell you America has crossed its last frontier.

QUALITY V YOUNGSTOWN I SERVICE

The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York

MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

RAILROAD TRACK SPIKES - CONDUIT - HOT AND COLD FINISHED CARBON AND ALLOY BARS - PIPE AND TUBULAR PRODUCTS - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RODS - SHEETS - PLATES.

THE BEAUTIFULLY STYLED

Aerofuse

TYPE "P" SERIES

CEILING DIFFUSER

Aerofuse – a famous name in diffusers – is now presented in an entirely new design that sets a new high in appearance and performance at the vital point of air delivery.

BEAUTIFULLY STYLED, the four diffuser types in the new line feature matching facial contours. All sizes have the same number of rings. Thus uniform appearance is assured when more than one type, or various sizes, are installed in a conditioned space.

TYPES AVAILABLE . . . Type "PA" provides pattern adjustability. . . . Type "PF" is a fixed pattern diffuser . . . Type "PS" high capacity diffuser for industrial applications . . . Type "PR" supply and return diffuser.

For complete details, write for Catalog No. 105.

TUTTLE & BAILEY INC

NEW BRITAIN, CONNECTICUT

KENNARD WATER SAVERS
Engineered

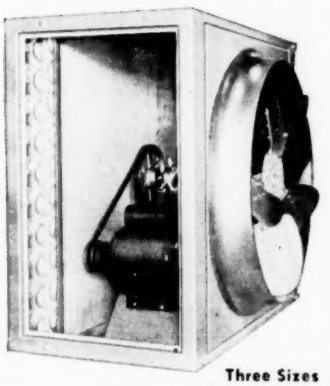
Announcing the latest addition to the .....

PACKAGED ECONOMY LINE
RESIDENTIAL—COMMERCIAL—INDUSTRIAL

AIR COOLED CONDENSER

Kennard planned for quiet operation; incorporating a specially designed air venturi, and a top quality five blade heavy duty fan.

Continuous capacity operation is assured by a generous coil surface and a long lived "V" belt drive.



Three Sizes
2, 3 and 5 Tons

TWO OTHER EFFICIENT

WATER SAVERS

TO SERVE YOUR PARTICULAR NEEDS

Five Sizes
3, 5, 8, 11 and 16 Tons

KT—COOLING TOWERS
EK—EVAPORATIVE CONDENSERS

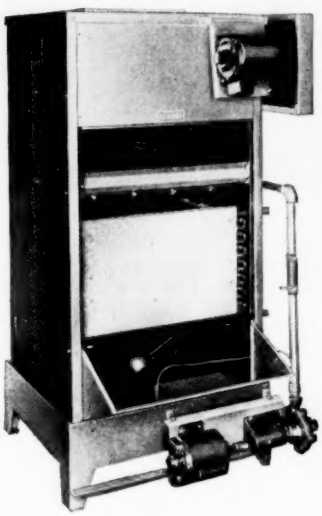
Kennard selected centrifugal type fans (Hot-Dip Galvanized) for quiet operation and for their ability to ***overcome duct resistance*** on indoor installations, and adverse wind effects on outdoor installations.

Completely galvanized cabinets, rugged enough for ***outdoor*** use, and completely coated on interior with an asphalt and asbestos fibre material for further rust-proofing.

Wetted Deck of the Cooling Tower is long lived clear heart of redwood.

The Evaporative Condenser has all prime surface copper coil.

For Air Conditioning Units and larger Water Savers, see the Kennard Representative, or write for special bulletins..



Five Sizes
3, 5, 7½, 10 and 15 Tons

Representatives in all principal cities

KENNARD CORPORATION • 1823 S. HANLEY ROAD ST. LOUIS 17, MO., U.S.A.

RED WING, MINNESOTA
A DETROIT STOKER TOWN

Two Hospitals • The High School • A Hotel
Three Industrial Plants • And the Power Company
All Equipped with Detroit Stokers.

14 DETROIT STOKERS (INDUSTRIAL TYPE) IN 7 PLANTS

Red Wing, Minnesota has a very high percentage of Detroit Stokers in comparison to the population of 10,000 people.

Red Wing Burns Coal—the Basic Fuel with Detroit Stokers because they are always dependable, economical.

Write for Catalog

DETROIT STOKER COMPANY

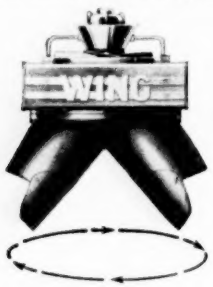
GENERAL MOTORS BUILDING, DETROIT 2, MICHIGAN

Works at Monroe, Michigan • District Offices in Principal Cities

HEAT THAT MOVES AROUND

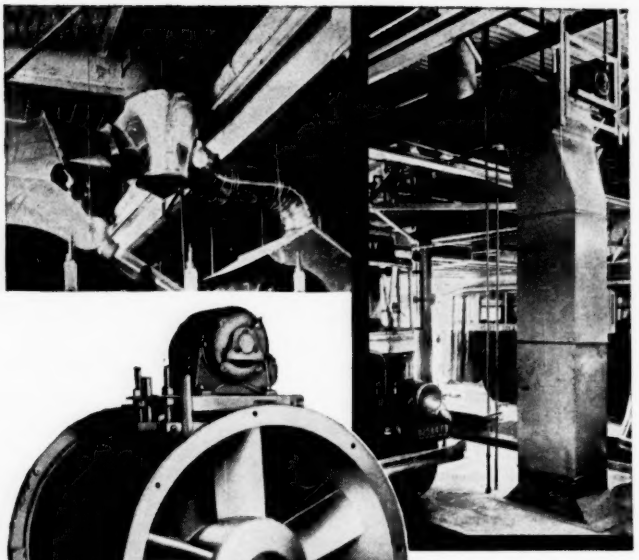
with the WING REVOLVING HEATER

The fact that the discharge outlets of Wing Revolving Heaters keep the heated air in gentle, constant motion is the reason firms like the Budd Company have installed Wing Revolving Heaters in their plants, both at Philadelphia, and at the plant shown in the photograph above at Gary, Indiana. Big blanking and forming presses make a natural barrier to ordinary heating systems, but

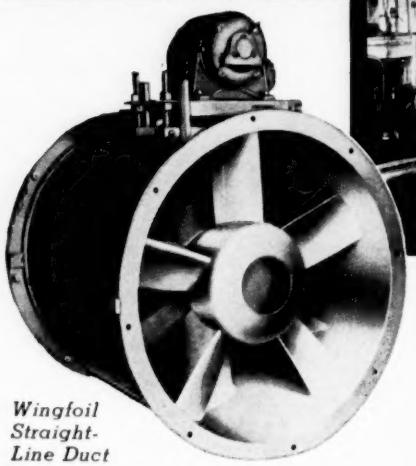


not to the moving streams of heated air from the Wing Revolving Heaters, even suspended, as they must be, far above the floor to clear the cranes. Uniform distribution is accomplished because the moving streams of heated air sweep slowly around through 360 degrees, covering successively every direction; thus every part of the plant is kept at a comfortable temperature. And in Summer, with the steam turned off and fans on, the revolving discharge outlets create a sensation of pleasing coolness that is very refreshing even on the hottest days.

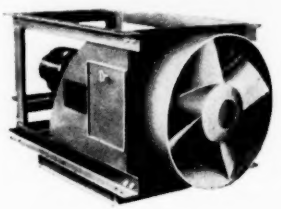
Write for a copy of Bulletin HR-6 to L. J. Wing Mfg. Co., 158 Vreeland Mills Road, Linden, New Jersey.



Upper left: Wingfoil Straight-Line Duct Fan in Textile Mill. Upper right: Wingfoil Elbow Type Duct Fan exhausting gases in a Garage.



Wingfoil Straight-Line Duct Fan



Wingfoil Elbow Type Duct Fan

WINGFOIL DUCT FANS DELIVER LARGE AIR VOLUMES WITH LOW POWER CONSUMPTION

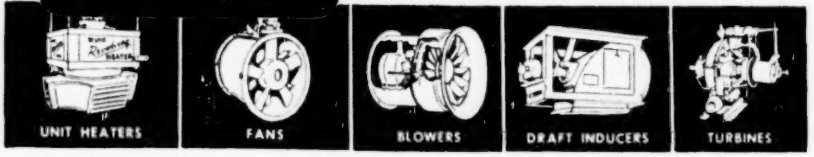
The WINGFOIL Axial Flow Duct Fan, in either elbow or straight line type, is a compact, economical fan, designed to operate against static pressure. Both types have the motor outside the casing, unaffected by hot or dirty gases. Light weight, compact, easily handled, they may be inserted as elbow or straight section into a line of duct.

Write for Bulletin F-10.

Wing

L. J. Wing Mfg. Co.

158 Vreeland Mills Road
Linden, N. J.
Factories:
Linden, N.J. and Montreal, Canada



from the **Simplest** Single Pipe System...

to the most **Complex** Multiple Pipe Installation...

"Z"crete®

THE MODERN MONOLITHIC INSULATION

Pouring Z-Crete Insulation into forms for single pipe system to provide an insulated conduit that is strong, resilient, compact and efficient.

Conduit containing 10 pipes in typical installation. Pipes anchored to base, support blocks in place prior to pouring of Z-Crete. Low cost construction.

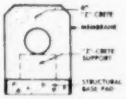
Insulates underground heated piping *easier, economically, permanently!*

No pipe arrangement too tough for this versatile insulation! Z-CRETE affords permanent insulating efficiency—forms a safe, solid monolithic protection around one pipe or a *dozen* in the same conduit . . . without joints or voids. Hundreds of thousands of feet of Z-CRETE have been installed in all parts of the country and in all types of soil conditions. Any number, size or arrangement of pipes can be designed into a Z-CRETE conduit. Made of inorganic, rotproof, insulating concrete—monolithic pour assures restricted water movement around the assembly. And you'll find it's usually the most economical system to install. Write for complete details today!

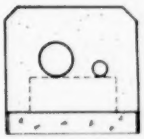
No Other Insulation for Underground Piping Offers All These Superior Advantages!

- **More Adaptable**—Z-Crete is entirely a field fabrication. No pre-formed sections are required.
- **More Economical**—Low in cost, provides permanent and stable insulation. Especially economical in large pipe or multiple pipe conduits.
- **More Efficient**—Six inches of insulation around piping provides plus insulation value—eliminates heat loss due to air movements.
- **Permanent**—Will not rot or deteriorate, water-resistant. It's resilient, completely fireproof.
- **Readily Available**—No critical materials required. Experienced, licensed applicators, located in all parts of the country, are ready to serve you.

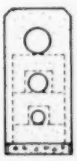
FOR ANY HEATED UNDERGROUND SYSTEM



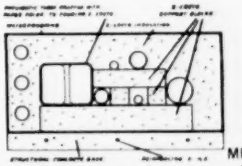
SINGLE PIPE CONDUIT



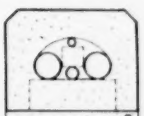
TWO PIPE CONDUIT



PIPE OVER PIPE



MULTIPLE PIPE CONDUIT



MULTIPLE PIPE CONDUIT WITH STEAM TRACER

"Z"crete®

DIVISION

ZONOLITE COMPANY

135 So. LaSalle Street • Chicago 3, Illinois

Z-Crete is furnished and installed only by licensed applicators of Zonolite Company under U. S. Patent No 2355966—Canadian Patent No. 439356

WRITE FOR FREE BOOKLET!

Z-CRETE DIVISION,
ZONOLITE COMPANY
Dept. HV-63
135 S. LaSalle St., Chicago 3, Ill.

Please send FREE Z-Crete Booklet with full details and specifications about this easier, better insulation of underground heated piping.

Name.....

Company.....

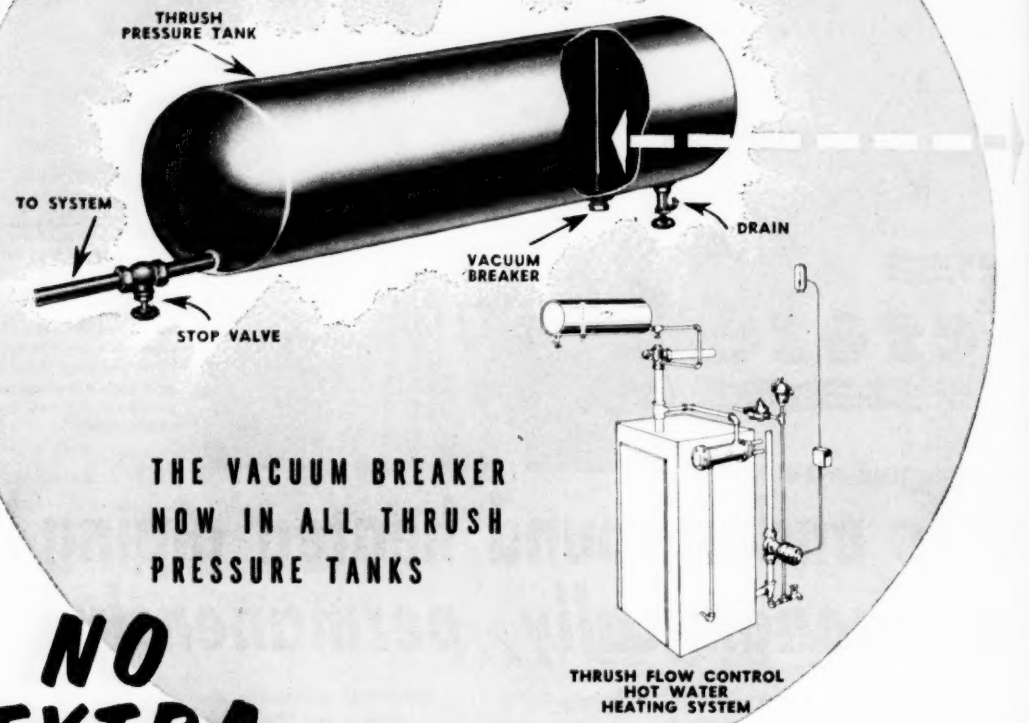
Address.....

City.....Zone.....State.....

NEW THRUSH TANKS

Reduce Draining Time

DRAIN COMPLETELY IN A FEW MINUTES



THE VACUUM BREAKER NOW IN ALL THRUSH PRESSURE TANKS

NO EXTRA COST

THE FIRST REAL IMPROVEMENT IN TANK DESIGN IN MANY YEARS! THRUSH ENGINEERING LEADS AGAIN!

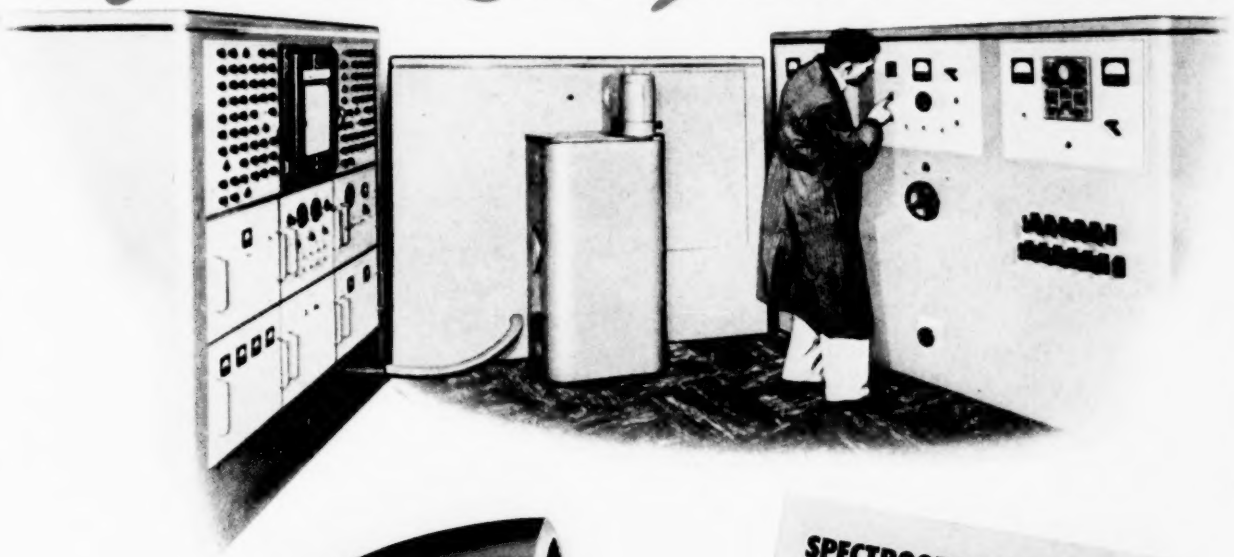
HERE'S AN ADDED convenience feature found only in Thrush Pressure Tanks! It saves your time! . . . saves labor! Reduces service bills! Pleases customers because you can get the system back in operation without delay. No need to drain the whole system. Just close the stop valve, open the drain and unscrew the Vacuum Breaker to allow air to enter the tank. A thirty gallon tank will drain in ten minutes. You get more for your money . . . build greater customer satisfaction, too . . . when you install genuine Thrush equipment. Ask your wholesaler about it or write Dept. D-6.

TO BE SURE IT'S A GENUINE THRUSH PRESSURE TANK . . . LOOK FOR THE VACUUM BREAKER BEFORE YOU BUY!

H. A. THRUSH & COMPANY

PERU, INDIANA

LADISH *Controlled Quality* ASSURES METALLURGICAL SOUNDNESS



SPECTROGRAPHIC ANALYSIS
One of many comprehensive Ladish laboratory test procedures for assuring reliable performance.

TO MARK PROGRESS

Ladish measures the spectrum to verify chemical composition

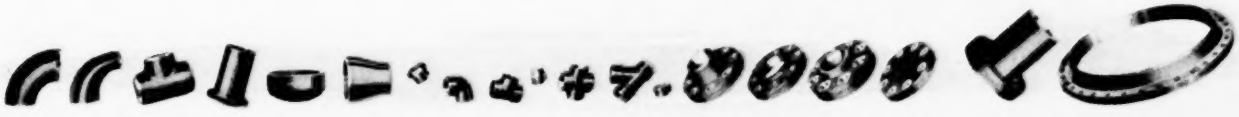
Metallurgical integrity—is safeguarded at Ladish by unsurpassed laboratory controls. Typical is this advanced electronic direct-reading spectrograph. On this unit as many as 300 determinations have been made in one hour to verify compliance of each mill heat with exacting Ladish specifications and, equally important, to assure the absence of detrimental "tramp" elements. Here is but one indication of the thorough, scientific procedures that assure reliability in every Ladish Controlled Quality fitting.

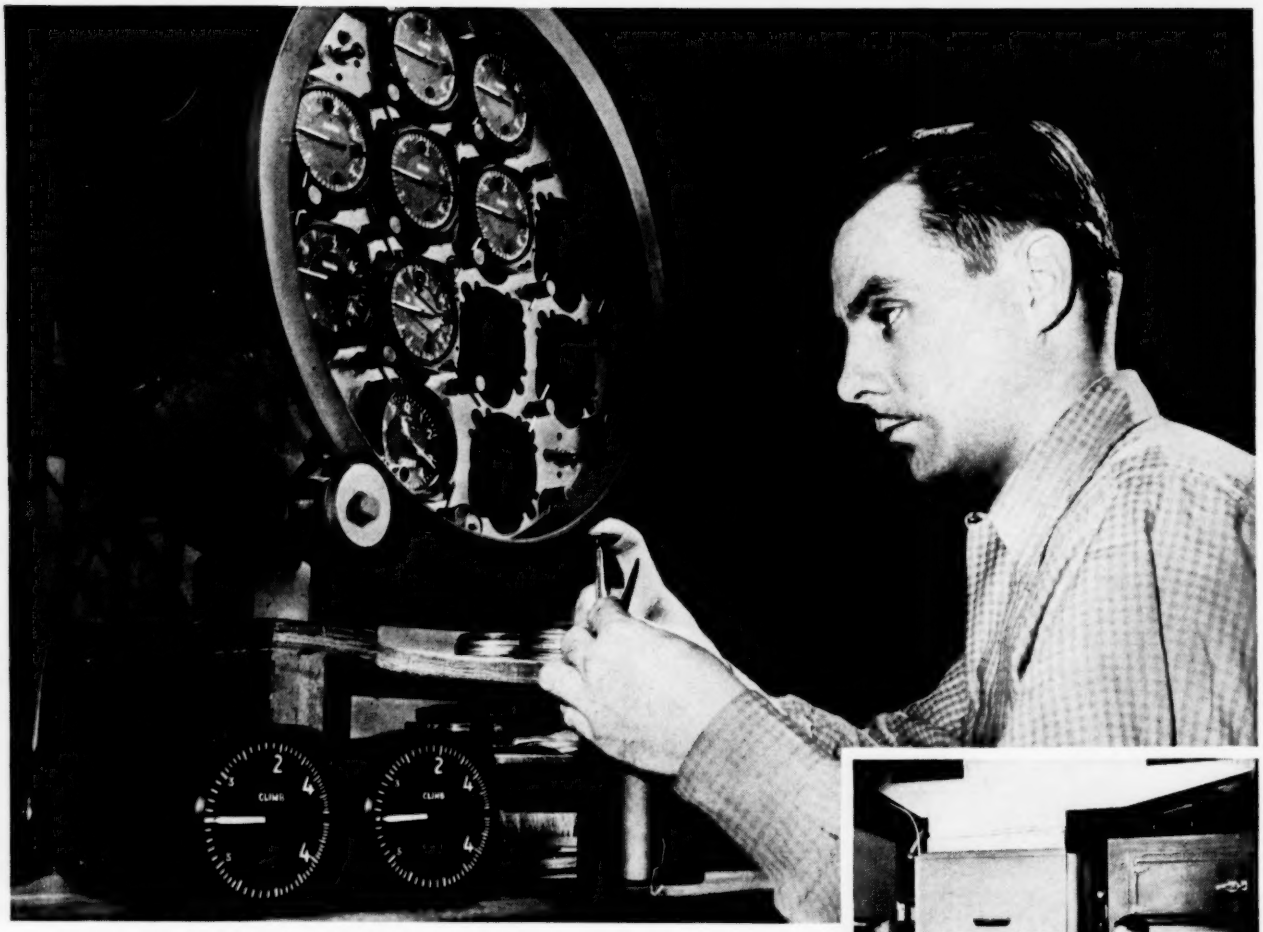
THE COMPLETE *Controlled Quality* FITTINGS LINE
PRODUCED UNDER ONE ROOF . . . ONE RESPONSIBILITY

LADISH CO.

CUDAHY, WISCONSIN
MILWAUKEE SUBURB

District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago • St. Paul
St. Louis • Atlanta • Houston • Tulsa • Los Angeles • San Francisco • Havana • Mexico City • Brantford, Ont.





Putting Air To Work For Kollsman: When accuracy measures ± .0002, dirt specks and moisture are poison.

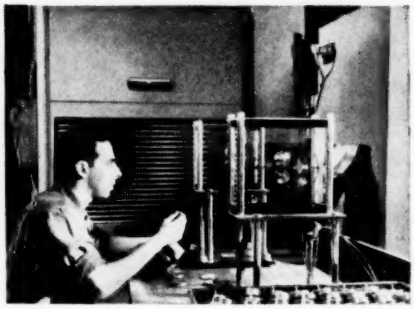
CONDITIONED AIR

KEEPS INSTRUMENTS ACCURATE 15 MILES UP

Airborne dirt and moisture are an expensive problem in assembly and testing of delicate aircraft instruments. But Kollsman Instrument Corporation found the economical solution. Fifteen Westinghouse Unitaire® Conditioners now process the air for an entire assembly floor.

By "zoning" this space, each UNITAIRE cools and dehumidifies its assigned area. This gives uniform air conditioning even though heat and moisture-producing operations on the floor vary. And Unitaire Conditioners are easily moved as production layouts change.

You can get the UNITAIRE now from your Westinghouse Air Conditioning Distributor's stock. Call him today. He's listed in the Yellow Pages of your telephone directory. Westinghouse Electric Corporation, Air Conditioning Division, Hyde Park 36, Massachusetts.



Where heat and humidity hamper skilled hands, a UNITAIRE gives constant temperature-humidity control. That's why Quinn Engineering Co., New York, has added ten more units to another Kollsman plant this year. Completely built by Westinghouse with its own proved parts, the UNITAIRE gives trouble-free service and economical operation.

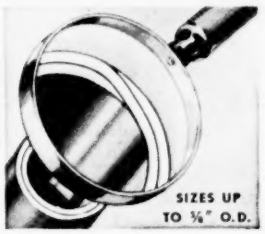
WESTINGHOUSE AIR CONDITIONING

YOU CAN BE SURE...IF IT'S Westinghouse

J-80310

Extra-rugged, lightweight Bundyweld Tubing handles easily on job site. Won't dent under usual rough handling. Bent by one man, positioned by two, Bundyweld saves time and costs.

Let competition eat your dust; be first with Bundyweld Ceiling Radiant Heating



Key to Low Cost

Bundyweld is the only tubing double-walled from a single strip, copper-brazed through 360° of wall contact. It's leakproof, thinner-walled, yet stronger. It transmits heat quickly, has high bursting strength. It saves on material costs and installation time.

Standard 20' lengths of Bundyweld are easily formed into coils in shop or on job site. Expanded ends (furnished when specified) are quickly soldered into leakproof union. Joined, lightweight coils are easily mounted onto ceiling, quickly plastered over.

Now's the time to let late-starting competition eat your dust, while you run up a lasting lead . . . with the heating system that makes others obsolete.

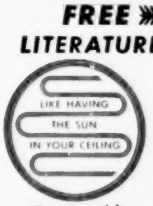
Satisfied users in hundreds of communities have learned that Bundyweld Ceiling Radiant Heating is free of drafts, dust, soot; is noiseless, even-temperatured and economical; eliminates space-robbing radiators and registers; postpones costly redecorating for *years.* With all these solid advantages, it installs with "one, two, three" ease.

Thousands of prospective home builders and buyers hear these user reports, read Bundy ads in *Better Homes & Gardens, American Home, House Beautiful,* and *Small Homes Guide.* Interest turns into enthusiasm; we've answered a small blizzard of requests for literature and *names* of local plumbing and heating contractors handling Bundyweld Ceiling Radiant Heating.

You'll profit *most* by being the *first* in your area to offer what's so obviously wanted—the first big heating advance in years. Why not mail coupon tonight?

Radiant Heating Division
BUNDY TUBING COMPANY
Detroit 14, Michigan

SEND FOR FREE LITERATURE!



Bundyweld
Ceiling Radiant Heating

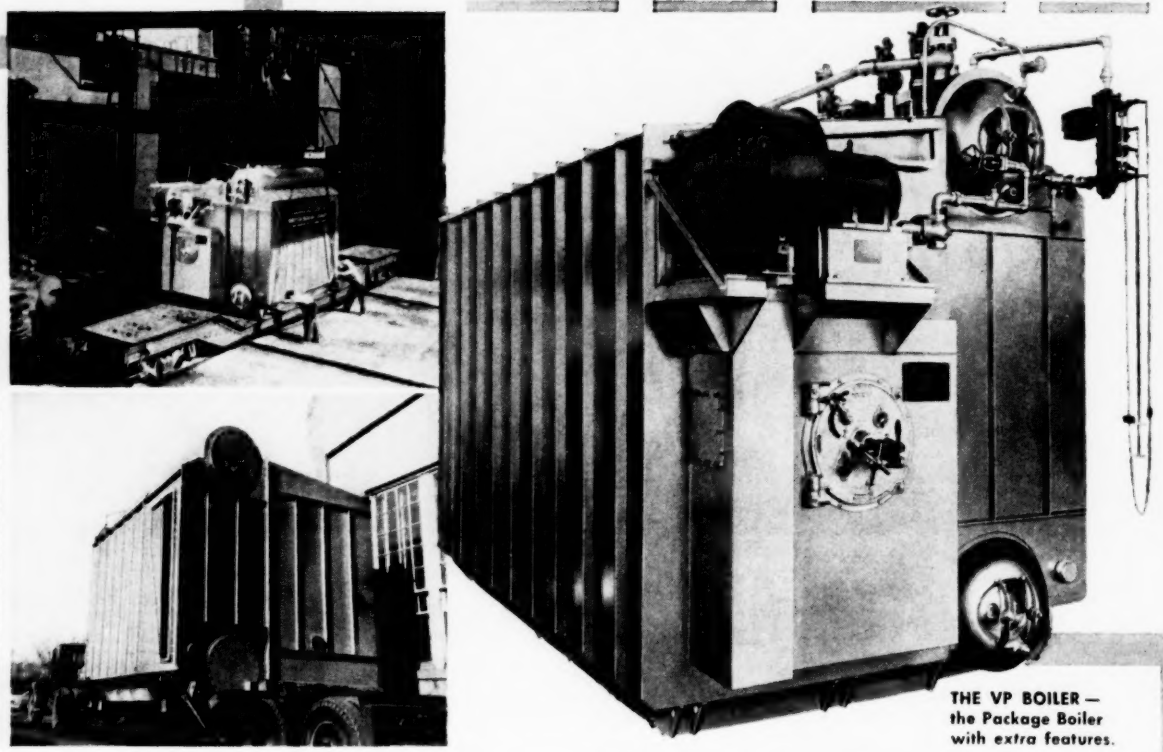
Radiant Heating Division, Dept. HV-653
Bundy Tubing Company, Detroit 14, Michigan

☐ Send free 20-page nontechnical brochure explaining Bundyweld Ceiling Radiant Heating.
☐ Send Bundy technical radiant heating pamphlet.

Name_____ Title_____
Company_____
Address_____
City_____ Zone____ State_____

4 reasons why...

THE VP PACKAGE IS YOUR BEST BOILER BUY



THE VP BOILER — the Package Boiler with *extra* features.

1 Fully Water-Cooled Furnace — More cooling area per cubic foot of furnace volume than any other boiler of the VP's size and type. In all but the three smallest sizes, the VP Boiler has water-cooled walls on *all six sides* — including the burner wall. Assures rapid, efficient heat absorption. Minimizes furnace maintenance.

2 Larger Lower Drum — The 30 in. diameter lower drum permits a simple, symmetrical tube arrangement . . . provides easy access for washing down or inspection . . . its greater water storage capacity facilitates the handling of fluctuating loads.

3 Simple Baffle Arrangement — Minimum changes in direction — no baffle at all in convection bank in larger VP Boilers. This means lower draft loss . . . simplified soot blowing . . . elimination of dead pockets, thus, maximum heat pick-up. In the intermediate sizes, a water-cooled baffle assures minimum maintenance.

4 Centrifugal Fan — This more efficient type of fan operates at lower speed than other types and is quiet in operation. In fact, its average noise level is less than half that of typical high-speed blowers used in most package boilers.

These four *extra* features are yours *only* in the VP Boiler which is designed and manufactured by Combustion — maker of many of the world's largest boilers. These units are available in capacities ranging from 4,000 to 30,000 lb of steam per hr, and pressures up to 250 psi.

Complete details on the C-E Package Boiler, Type VP, are available to you. Send for your free copy of Bulletin VP-201.

B-6668

COMBUSTION ENGINEERING, INC.

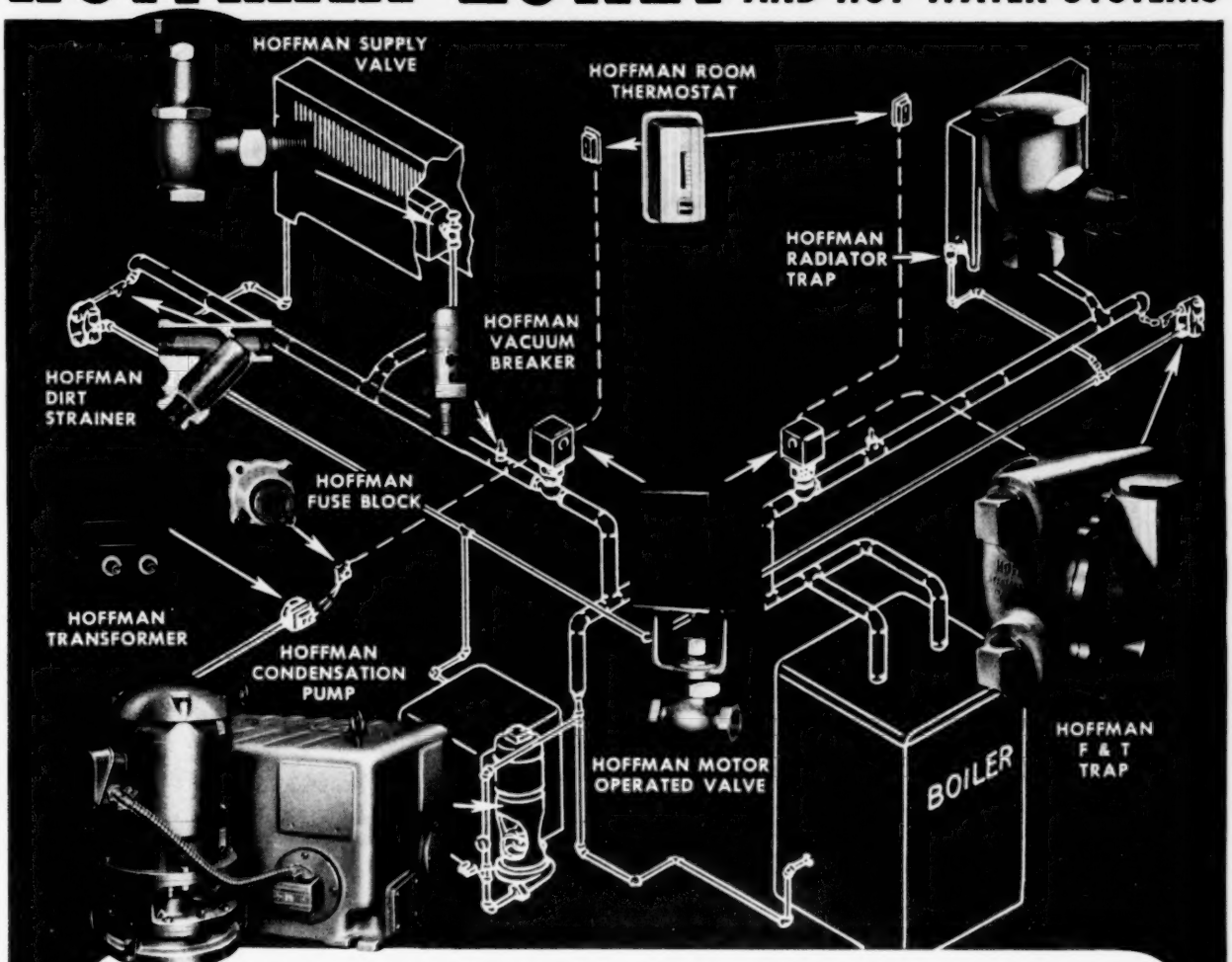
C·E

200 MADISON AVENUE, NEW YORK 16, N. Y.

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

HOFFMAN ZONET

ZONE CONTROL FOR STEAM AND HOT WATER SYSTEMS



Hoffman "Zonet" Packages are available in many sizes for both steam and hot water service. Select the system required for each project from the data tables below. When selecting a zone Valve, keep in mind that it is very important to estimate as carefully as possible the maximum pressure differential across the valve. The capacity of these "Zonet" motorized valves is based upon the difference in pressure between the initial pressure side and the radiation side. Capacities are given in terms of equivalent square feet of radiation. Write for bulletin, no obligation.

Steam Capacities in Equivalent Square Feet of Radiation (240 BTU per Square Foot)

Valve Size in Inches	2# Initial Gauge Pressure			5# Initial Gauge Pressure			10# Initial Gauge Pressure			15# Initial Gauge Pressure		
	Pressure Drop			Pressure Drop			Pressure Drop			Pressure Drop		
	¼#	½#	1#	1#	2#	3#	2#	3#	4#	3#	5#	7#
½"	117	170	240	256	357	426	480	480	640	560	720	853
¾"	234	330	469	506	720	906	773	960	1,226	1,040	1,360	1,600
1"	400	560	800	880	1,226	1,520	1,306	1,600	2,080	1,760	2,293	2,666
1¼"	666	933	1,333	1,440	2,026	2,453	2,106	2,560	3,306	2,826	3,680	4,266
1½"	800	1,120	1,546	1,653	2,240	2,880	2,400	2,986	3,840	3,306	4,266	5,333
2"	1,226	1,760	2,506	2,720	3,840	4,693	4,266	5,226	6,666	5,866	7,466	9,066
2½"	1,866	2,666	3,733	3,946	5,866	6,933	5,866	7,466	9,600	8,266	10,666	12,800
3"	2,933	4,133	5,813	6,400	8,906	10,666	9,600	12,266	15,466	12,800	16,000	18,668
4"	5,066	7,200	10,133	10,666	14,933	18,666	17,600	21,333	27,200	17,600	29,332	34,668
5"	8,000	11,200	16,000	16,533	23,466	28,000	26,666	32,533	41,600	These valves will not operate against pressures over 10#		
6"	11,200	15,466	21,866	23,466	33,066	40,533	36,266	44,266	57,066			

Water Capacities in Gal. per Minute

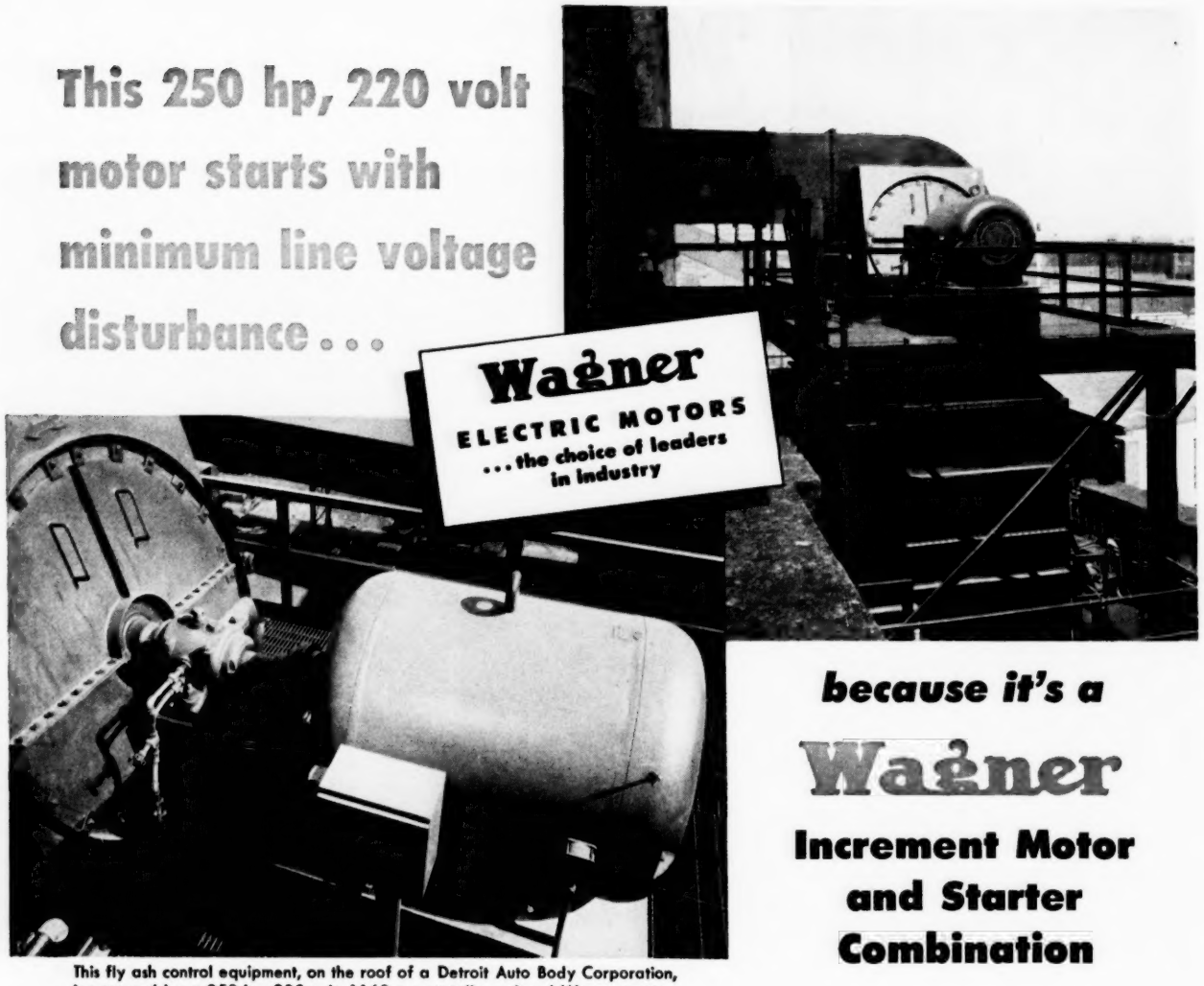
Pressure Drop Across the Valve Measured in Feet Head of Water	Valve Sizes							
	½	¾	1	1¼	1½	2	2½	3	4
1	2.6	5.3	7.9	14	18	28	40	65	112
2	3.6	7.5	11	20	25	40	63	90	155
3	4.3	9.3	13	24	31	50	71	108	188
4	5.3	10.5	16	28	34	58	83	123	210
5	5.9	12	17	30	40	63	92	139	244
10	7.9	16	24	42	54	89	125	198	343
15	10	20	30	53	73	111	165	238	416
20	12	24	37	65	79	132	191	277	482
30	14	28	42	75	103	156	233	336	586
40	16	31	48	84	108	178	250	396	686
50	18	35	54	94	121	200	280	444	
60	19	39	59	103	132	218	306	485	

HOFFMAN STEAM AND HOT WATER SPECIALTIES

HOFFMAN SPECIALTY MFG. CORP. **Dept. HV-6 1001 York St., Indianapolis 7, Ind.**

VALVES, TRAPS, VACUUM AND CONDENSATION PUMPS, FORCED HOT WATER HEATING SYSTEMS Sold by leading Wholesalers of Heating and Plumbing Equipment

This 250 hp, 220 volt motor starts with minimum line voltage disturbance . . .



This fly ash control equipment, on the roof of a Detroit Auto Body Corporation, is powered by a 250 hp, 220 volt, 1160 rpm, totally-enclosed Wagner motor.

because it's a Wagner Increment Motor and Starter Combination

The part-winding increment motor and starter combination (pioneered by Wagner) provides an economical method of starting polyphase squirrel-cage motors for any application where reduced current draw at start is required or desirable. No auto-transformers or resistors are necessary.

Voltage disturbances on the line are reduced because current taken from the line is not broken during the starting period—as is the case when auto-transformers or compensator-type starters are used.

You benefit when you install a Wagner increment motor and starter "package" because you get a highly efficient, most economical, motor and starter combination that limits inrush of motor current to values that are acceptable to most power companies for all or parts of their distribution systems.

* * *

When you standardize on Wagner Motors—you get the advantages of a liberal warranty . . . of nationwide service facilities, with on-the-spot service, replacement motors and parts available from 25 Wagner-owned Service Branches and more than 750 Authorized Service Stations. You can choose from a wide variety of types and sizes (from 1/125 to 400 hp.) Bulletin MU-185 gives complete information—write for your copy. Bulletin MU-128 gives full information on Wagner Increment Motor and Starter Combinations.

WAGNER ELECTRIC CORPORATION
6463 Plymouth Ave., St. Louis 14, Mo., U.S.A.

® Wagner Electric Corporation EST. WE 1891

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS – AIR AND HYDRAULIC

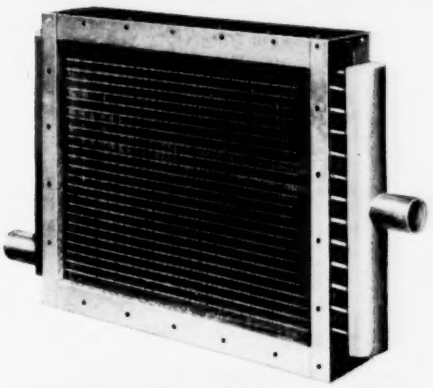
BRANCHES IN 32 PRINCIPAL CITIES

M53-6

Announcing a NEW LINE of.. YOUNG HEATING COILS

These Young Features Mean Greater Efficiency Longer Coil Life

1. Corrosion-resistant red brass tubes, staggered in multiple rows for maximum efficiency. Copper fins, heavy-wall Admiralty tubes available on special order.
2. Tubes mechanically expanded to fin collar to form double-wall, continuous metal transfer surface. Assures fidelity to rated standards throughout the life of the coil.
3. Headers formed from heavy-gauge (3/16"), hot-rolled steel with tube ends brazed into headers to insure a permanent, leak-proof joint. End support plate permits free expansion and contraction of tubes.
4. Heavy-gauge steel intermediate tube support formed by two cross angles welded to the tube support and the coil casing. Gives permanent reinforcement to entire coil structure.
5. Galvanized steel casings, with double channel top and bottom, provide support and protection for core. Flanges on four sides facilitate duct mounting and multiple bank installations.
6. Young steam and hot water Coil ratings conform to the proposed Standard Code of the Heating and Cooling Coil Manufacturers Association.
7. Young Coils offer maximum versatility in specifications due to their greater capacity range. Available in either 5 or 11 header widths, 19 tube lengths.



TYPE "S" STANDARD

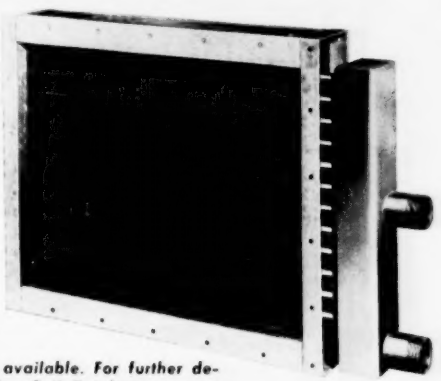
For steam or hot water service. Galvanized steel casings complete with drilled flanges on all sides for connecting to duct work, and permitting stacking in banks. Available in 11 nominal widths, 19 lengths from 12" to 120". Suitable for steam pressures from 2 to 150 psi and temperatures to 400 F. Type "S" coils incorporate Young features described at left.

TYPE "HD" HEAVY-DUTY

Recommended for severe industrial applications. Have same design features as Type "S" (above) except that the tubes are larger and of heavier-walled construction. Designed for steam pressures to 300 psi, and temperatures to 500 F. Available in 5 nominal widths, 19 lengths from 12" to 120".

TYPE "SD" STEAM DISTRIBUTING

For steam systems where performance is regulated by modulating supply of steam to coils. Double-tube feature provides protection when entering air temperatures are below freezing, and even temperature distribution along face of coil. Casing detail similar to Type "S." Available in 5 nominal widths, 19 lengths from 12" to 120". Suitable for steam pressures from 2 to 150 psi, with 25 psi recommended maximum.



Special-purpose, unencased coils available. For further details, including new Young Heating Coil Catalog, see your nearest Young Representative or mail coupon below.

YOUNG RADIATOR COMPANY
Dept. 523-F, Racine, Wisconsin
Plants at Racine, Wisconsin and Mattoon, Illinois
Sales and Engineering Representatives in All Principal Cities

heating coils by YOUNG
YOUNG RADIATOR COMPANY

WRITE FOR NEW, FREE CATALOG!

☐ Please send me your new, free Heating Coil Catalog just off the press.

☐ I would like your Representative to give me more details, without obligation.

Name_____

Company_____

Street_____

City_____ Zone_____ State_____

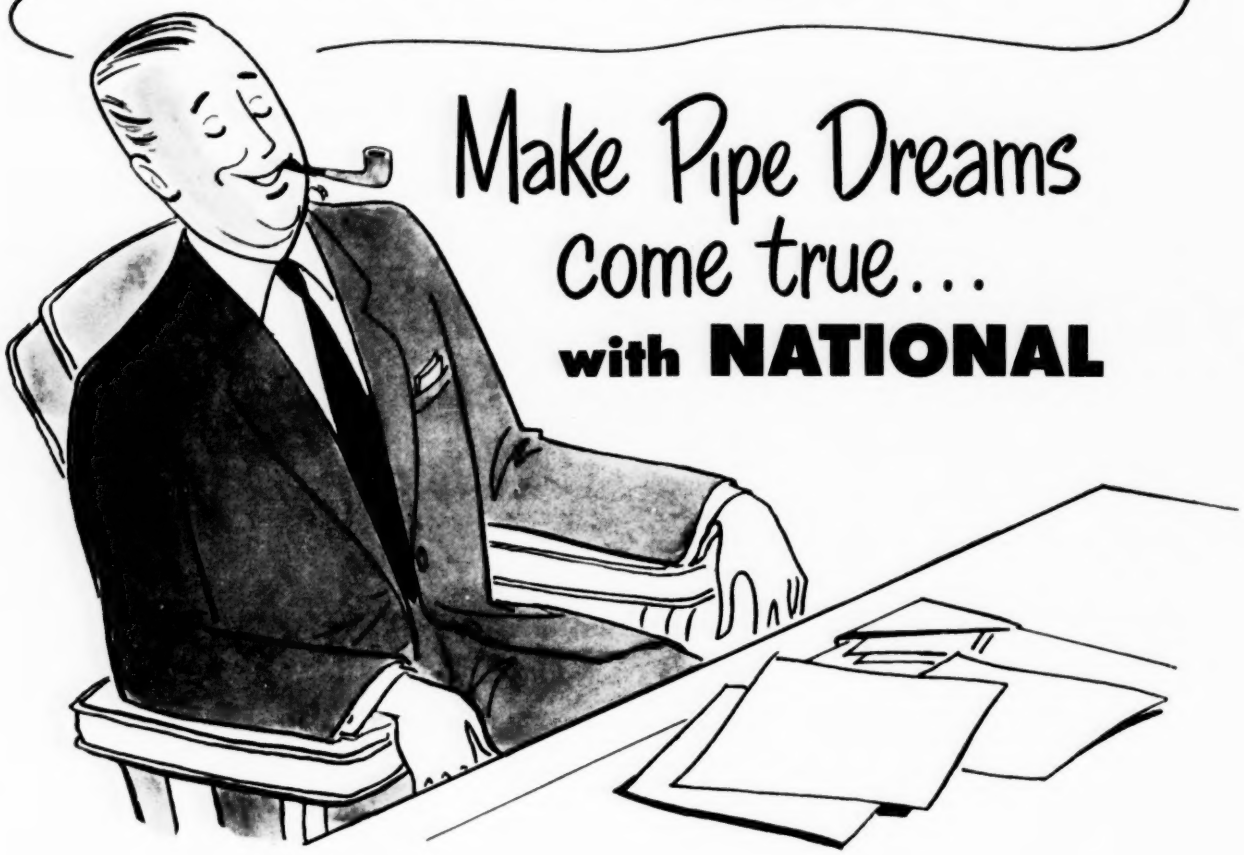
YOUNG

Heating, Cooling, Air Conditioning Products for Home and Industry

Heat Transfer Products for Automotive, Agricultural, Industrial, Gas and Diesel Engine Applications

Leaders in Heat Transfer Engineering for more than 25 years

SPECIFY *ONE* WORRY-FREE PIPE . . . THAT HAS *ALL* DESIRED QUALITIES . . . MEETS ALL SERVICE REQUIREMENTS . . . LOW FIRST COST, MINIMUM MAINTENANCE.



Make Pipe Dreams come true . . . with NATIONAL

If you have been wishing you could find *one* brand of pipe that would meet *all* service requirements, it's high time you got better acquainted with National Steel Pipe. So many architects, engineers and contractors have found the National line the solution to so many piping problems—during more than half a century—that they have made National the largest selling pipe in the world.

That preference was earned by the uniform high quality and complete dependability that is built into U·S·S National Steel Pipe. From raw material to finished pipe, every step in its production is controlled by one responsible organization. Improved steel-making facilities, special manufacturing processes and the lifetime experience of many skilled craftsmen, combine to produce pipe whose metallic structure, strength, sound joints, superior welding, bending and threading properties, assure low cost installation and long trouble-free performance.

That is why shrewd pipe buyers—generation after generation—continue to specify National, whenever they need pipe. They know that it fits every purpose at a cost that fits every purse.

So, whenever you need pipe for any type of building, make your pipe dreams come true. Get U·S·S National Steel Pipe.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S NATIONAL Steel PIPE

UNITED STATES STEEL

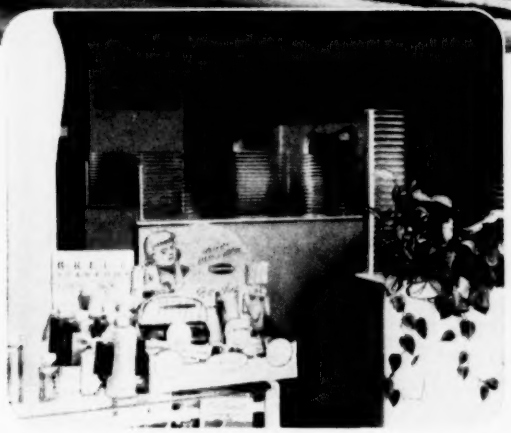
TRADE FRICK MARK®

UNIT AIR CONDITIONERS

Meet every commercial need. Available in sizes of 3, 5 and 7½ horsepower, these superior conditioners are the choice of the better class of users.

Extra-dependable: most of those installed in 1938 are still operating. You get this built-in reliability only when you specify Frick.

Let us show you their many other advantages: write for Bulletin 522. Some desirable territories still open for Distributors.



The Beauty Salon is one of eleven businesses using Frick Unit Air Conditioners at Freedom Shopping Center, Baltimore, Md.

Two Carvel Dari-Freeze Stores on Long Island are equipped with Frick 5-hp. Unit Air Conditioners

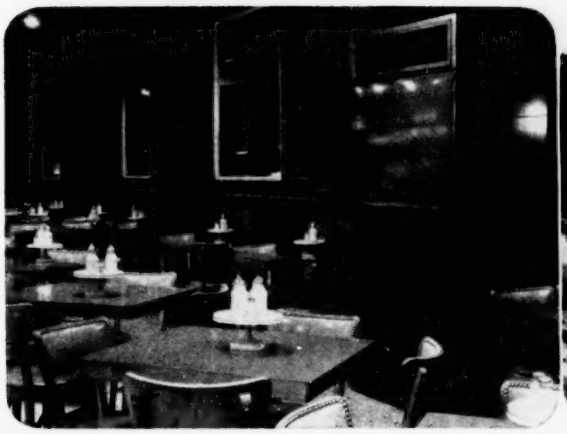
DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

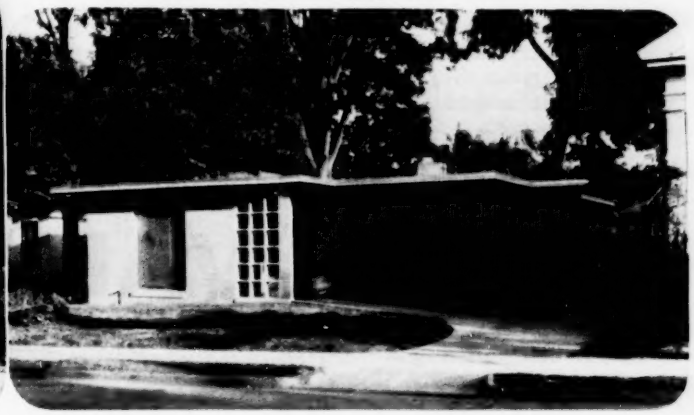
WAYNESBORO, PENNA. U.S.A.

Also Builders of Power Farming and Sawmill Machinery

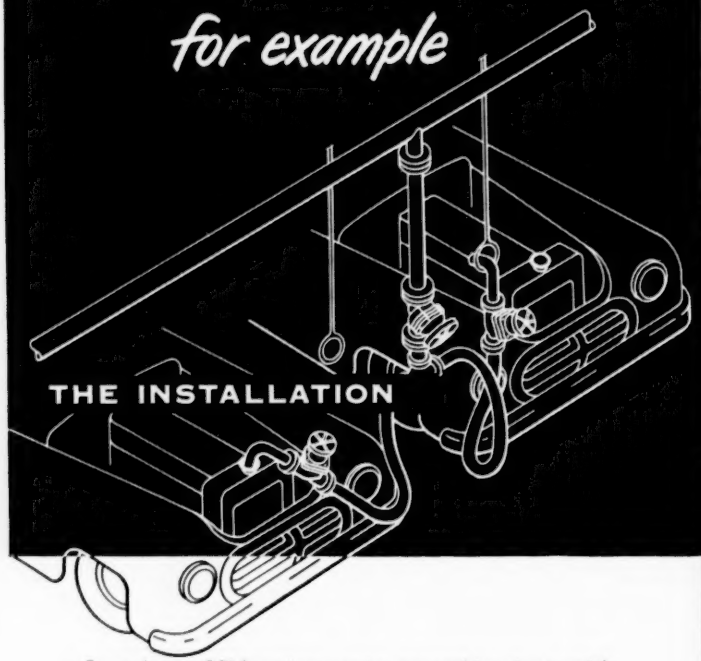
The Frick Unit blends-in well at the Boulevard Restaurant, 2407 Broadway, New York



Dr. Howell's Clinic at Canton, Miss., typifies the adaptability of Frick Units to varying needs



How Valve Life Changed from Days to Months ... on Crystalline Liquids, for example



In a large Midwestern auto assembly plant, with Crane Diaphragm valves in alcohol solution anti-freeze fill lines to automobile radiators.

VALVE SERVICE RATINGS

SUITABILITY:	Doing the job O.K.
FEATURES:	Packless; no leakage around stem
MAINTENANCE COST:	None
SERVICE LIFE:	Now 25 times longer than any valve used
OPERATING RESULTS:	Damage to production stopped
PRICE:	O.K. no premium
AVAILABILITY:	Regular Crane Catalog item. No. 1610

THE CASE HISTORY

None of the many conventional valves nor the plug cocks tried in this service lasted more than a week—about 2,000 operations.

The crystals present in anti-freeze would build up on seating surfaces and in the exposed valve stem threads. The valves leaked and were hard to operate. To the excessive maintenance needed was added the high cost of frequent damage to automobile finish by anti-freeze leakage.

Now Crane Packless Diaphragm valves control the trouble. Their sealed bonnet prevents contact of fluid and working parts; their seating design isn't hindered by crystal deposits. At last report, Crane valves have given over 50,000 trouble-free operations with no maintenance, and with indefinitely longer life assured.

THE VALVE

In Crane Diaphragm valves, the diaphragm serves only to seal the bonnet, not for seating. It isn't pinched or stressed when valve is closed. Independent disc gives control of fluid even should diaphragm fail. These valves are made in a wide variety of body, diaphragm, disc-insert, and body-lining materials to handle countless corrosive, abrasive, or ordinary services. See your Crane Catalog or local Crane Representative.

THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

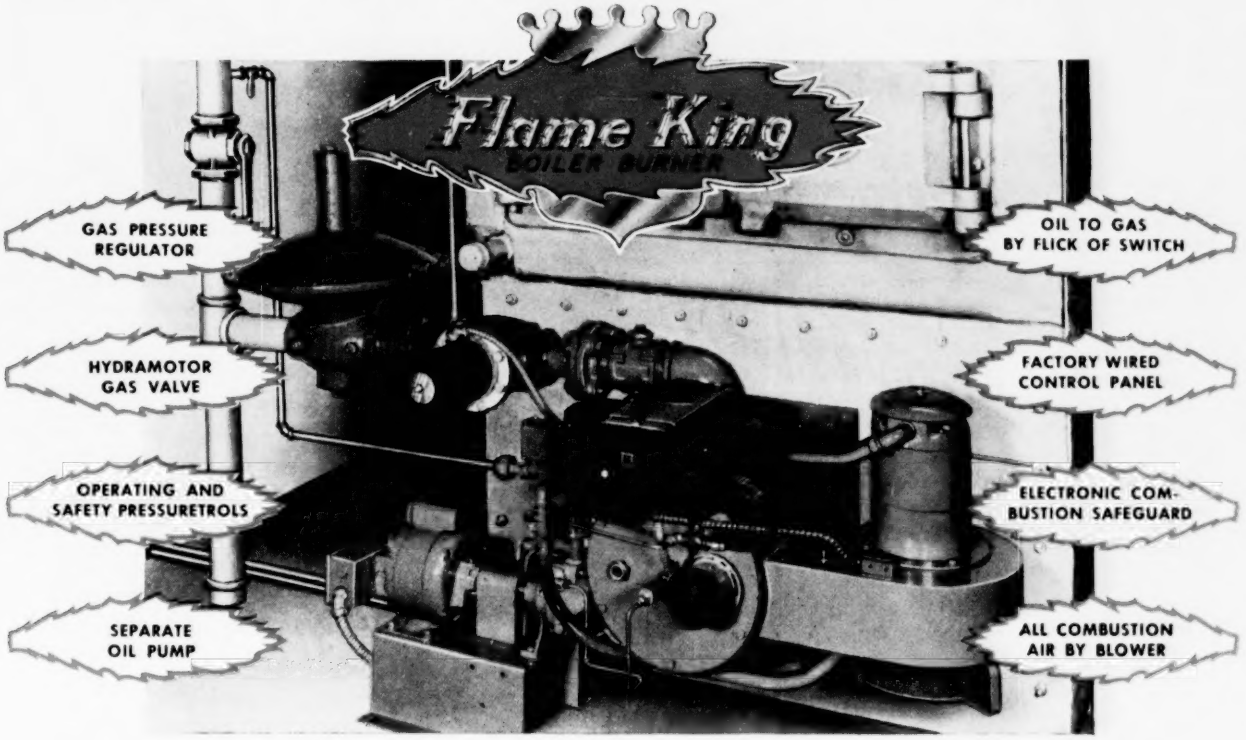
VALVES • FITTINGS • PIPE • PLUMBING • HEATING

Ultimate Performance

30 to 1000 horsepower

NORTH AMERICAN

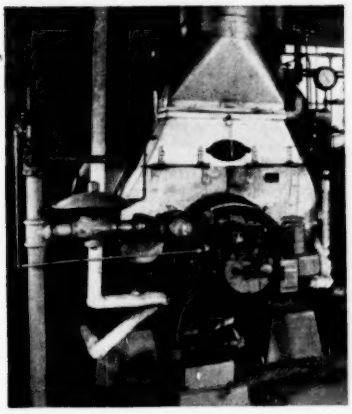
GAS, OIL or DUAL-FUEL



116 Dual-Fuel Burner illustrated available in models ranging from 30 to 83 HP

FLAME KINGS are available as gas or oil burners (that may be field converted to dual-fuel) or dual-fuel burners that will burn either fuel at the flip of a switch. Design, backed by 30 years of combustion experiences and proven by years of installations in all types of boilers, assures maximum efficiency on either fuel.

Factory packaging of FM approved electronic combustion safeguard systems provides for easy installations! Plug-in electrical components allow minimum maintenance! Burner efficiency is not dependent upon stack draft since a blower supplies 100% of the air for combustion! Blast-type gas pilot provides for positive and safe ignition!



FLAME KING on Scotch Marine Boiler

Natural gas (only 3" wc pressure necessary), mixed low pressure gases, or No. 1, 2, or 3 fuel oil burned at peak combustion efficiencies! Separate oil pump is operated only when burner is burning oil!

If you are interested in modern, efficient burners at reasonable prices, call your nearest FLAME KING distributor, or send in the coupon below.

Some areas still available for distributing representatives.

CUT OUT AND PASTE ON YOUR LETTERHEAD

We want more information

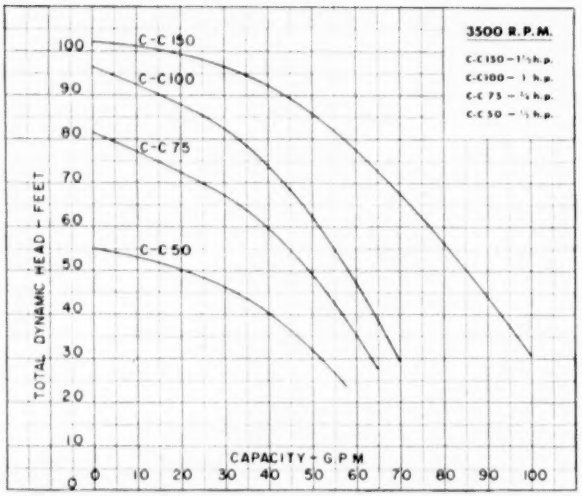
NAME_____

TITLE_____

Mail today to
The NORTH AMERICAN Mfg. Co.
Cleveland 5, Ohio

New CC CLOSE-COUPLED SERIES PUMPS

Set new performance standards



Each pump operates over the entire range of its curve without motor overload.

The New C-C Series pumps are more than just an improved line—they are an engineering achievement.

They definitely establish entirely new standards in close-coupled pump performance for:

Cooling Towers

Air Conditioning

Chilled Water Circulating

Hot Water Circulating

Pneumatic Water Systems

Booster Systems

The C-C Series pumps combine pump and motor in a single compact unit, eliminating coupling and alignment problems and assuring easy installation.

C-C Series pumps are equipped with a Leak-Proof "Chicago Mechanical Seal" consisting of a fixed-in-place carbon ring on a ceramic seat which is extremely hard and resistant to wear and corrosion. No maintainance or adjustment is necessary. No expensive piping is needed from drip pocket to drain. No messy floors.

See curves above for ½, ¾, 1 and 1½ H.P. models or write for Bulletin 108 F.

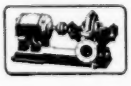
All models in stock for immediate shipment.

CHICAGO PUMP COMPANY

BUILDING and INDUSTRIAL DIVISION

622 DIVERSEY PARKWAY — **CHICAGO 14, ILLINOIS**

Condo-Vac, Sure Return, AVC, LVC, Fire, House & Circulating Pumps Pneumatic & Tankless Water Systems.



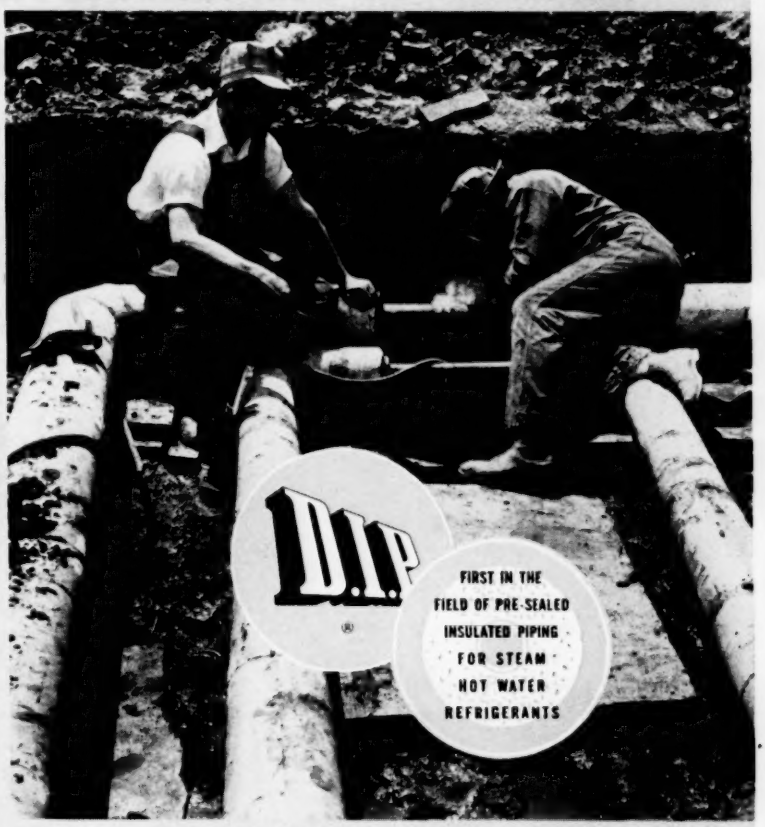
Flush-Kleen Sewage Ejectors Little Giant & Non-Clog Bilge Pumps Pumps for every industrial use

Pre-Fabrication makes a D.I.P. Conduit System Easy to Install

Here's what 2 Contractors say about DURANT INSULATED PIPE:

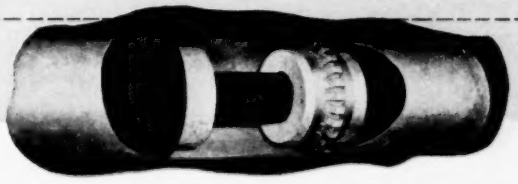
1. A superintendent had this to say about an air force job involving a large amount of D. I. P.: "All D. I. P. went in place exactly according to the Durant drawing except for one change: we had to cut off about 2" on one pipe." The superintendent also stated that, in his opinion, "if any contractor ever put in D. I. P. and had had experience with other types of underground pipe, that contractor would install *only* D. I. P. in the future."

2. A mid-western contractor said this about a D. I. P. installation: "On our job at J....., the D. I. P. went in perfectly: we had no trouble whatever. Furthermore, in the Spring a year ago, that area was flooded and the entire installation was under water for several months. This past Winter no trouble occurred in the D. I. P. system in spite of the flooding."



D. I. P. expansion loops. Pipe being welded prior to completing field joint.

D. I. P. railroad installation.



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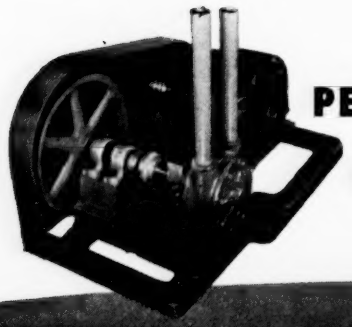

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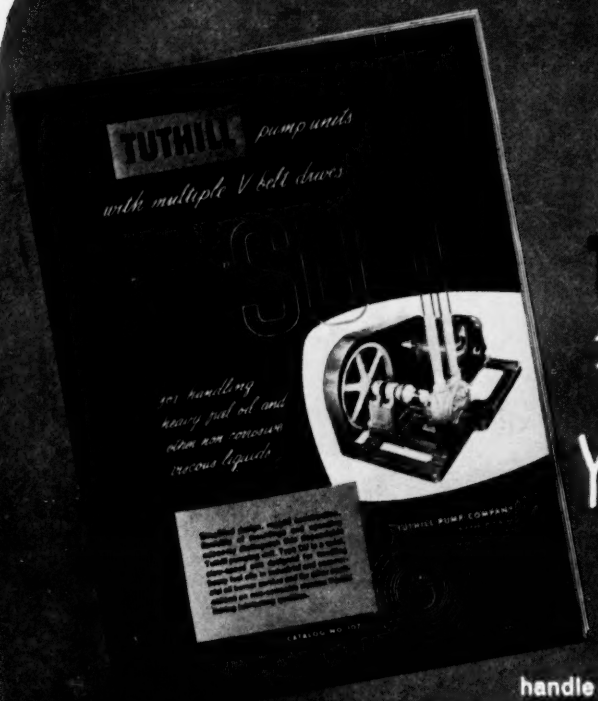

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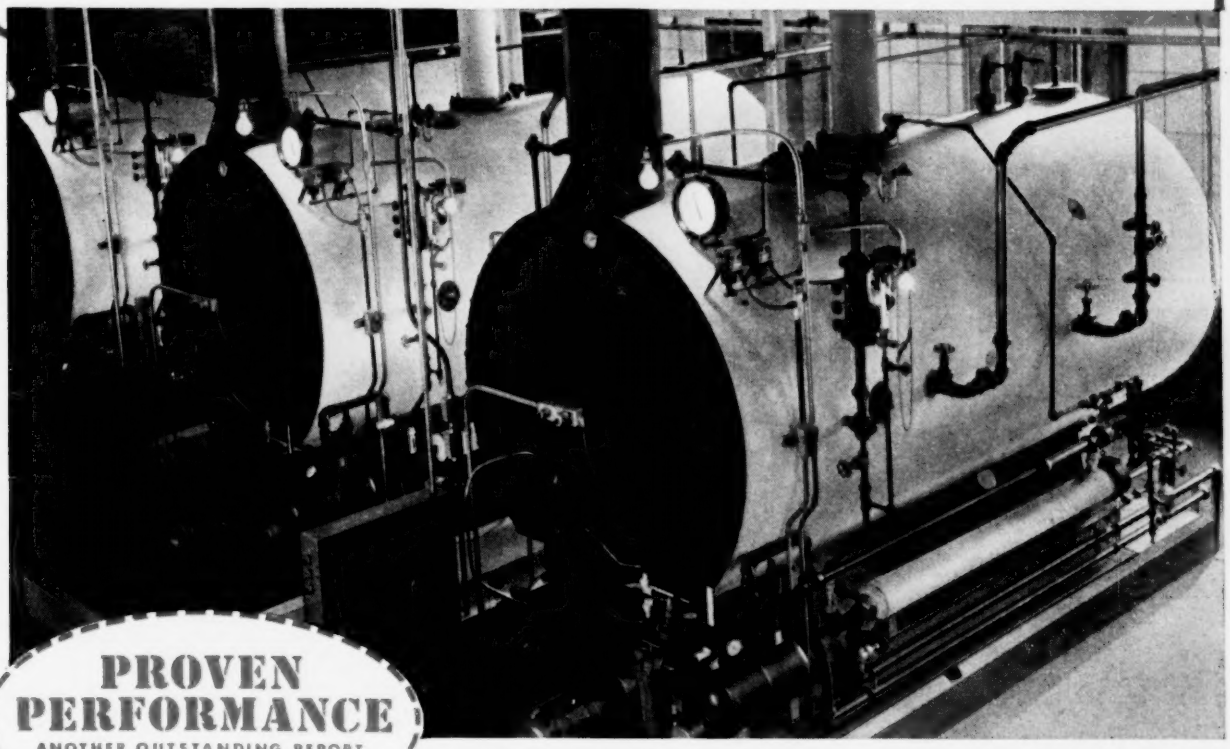

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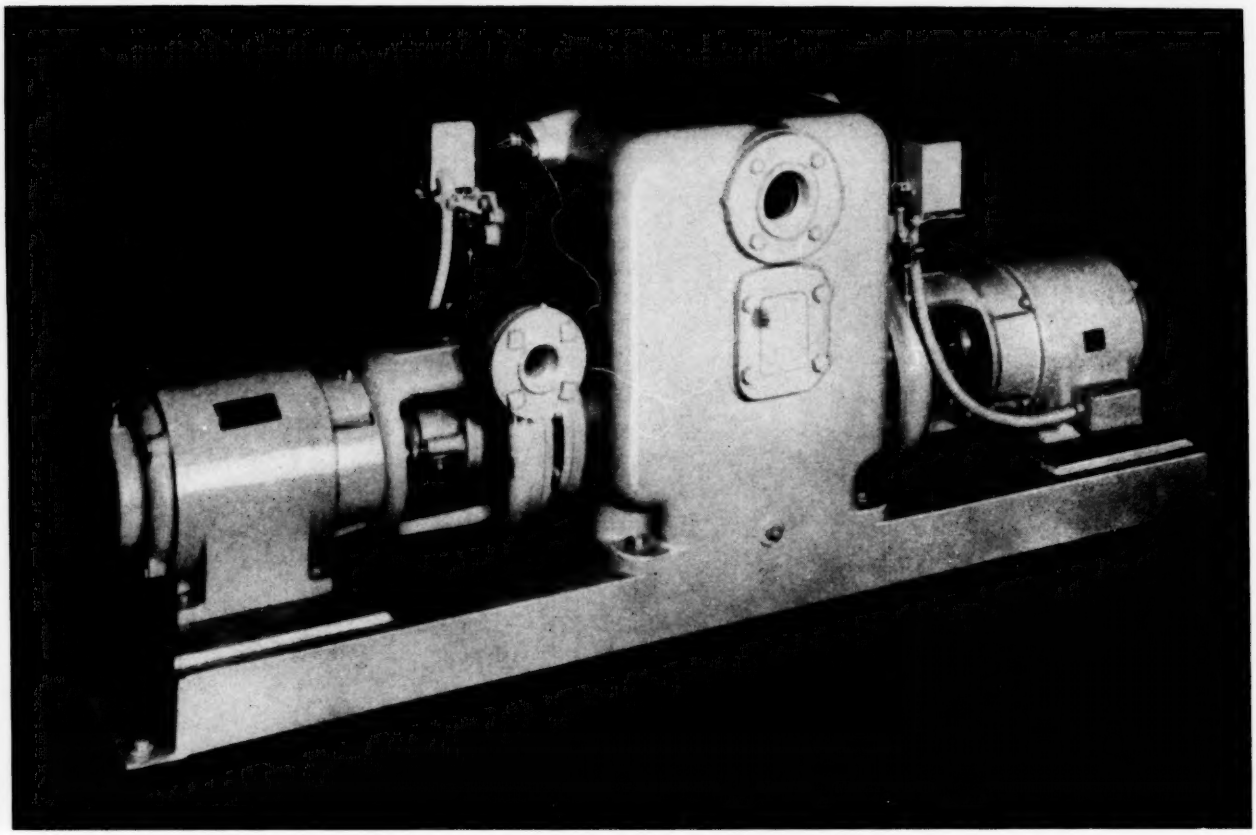

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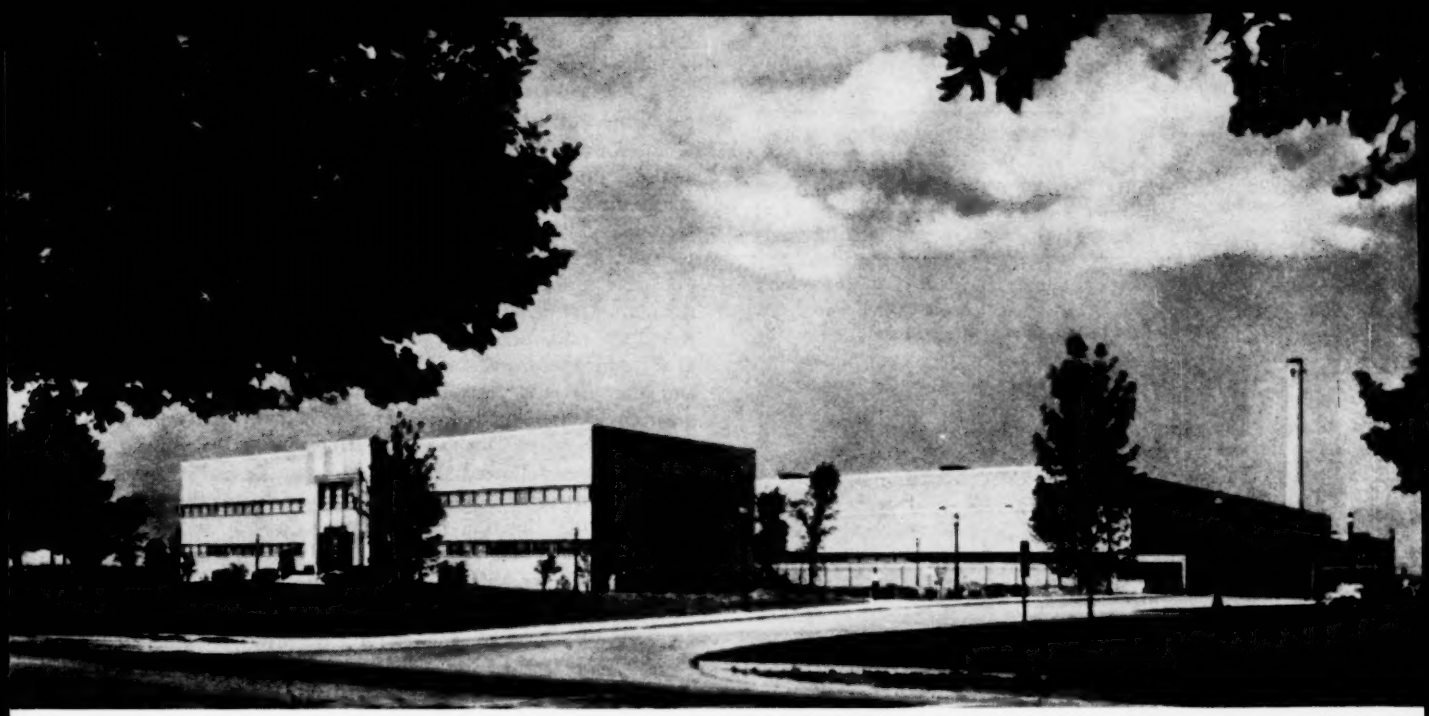

Air Flow Through Ceiling Pans

A. H. GIPSON

Engineer, Factory Planning, Western Electric Co., Allentown, Pa.

Results of a study into the use of acoustical ceiling pans for air distribution from an above-ceiling plenum. A number of rooms now use this system of air flow and the results have been satisfactory.

AIR inlets in air conditioned rooms are always a problem. They are usually noisy, drafty or become a depository for diffuser smudge. In an attempt to overcome these objections, engineers at Western Electric Company's plant in Allentown, Pa., (illustrated above) have been studying the use of acoustical ceiling pans for air outlets. To date, six rooms have been converted to this system and evaluations have proven its merit.

Installations of this type only require that there be an above-ceiling plenum and that the ceiling be made of perforated metal pans which are normally filled with paper covered rock wool sound absorbing pads. Removal of these pads permit conditioned air from the plenum to pass through the perforations into the room.

Fortunately, the characteristics of the first room converted were ideal for a study of this method of introducing air. Construction details and the method of supplying the conditioned air are shown in Fig. 1. The room was already supplied with filtered air by hot and cold air ducts thermostatically dampered at their junction for temperature control. The air inlet to the room had previously been a standard diffuser which was noisy, produced an undesirable draft condition along windows and walls, and left unsightly smudges on the ceiling. This room became an effective laboratory for checking results as there was an 8 ft high attic space to serve as a mixing plenum. With

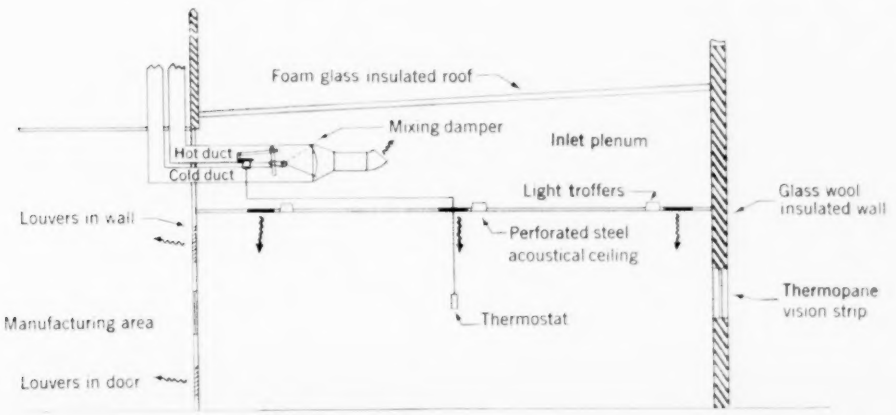

Fig. 1. Method of supplying conditioned air to first room converted.

Mr. Gipson, engaged in factory planning, has been with the Western Electric Company for twelve years and in that time has worked in four of the company's plants. He is constantly investigating means for holding down operating costs. During World War II he acquired five campaign ribbons with eight battle stars for naval actions.

this room-size mixing plenum, pads could be removed from various pans to permit a study of the effect of the patterns formed. This room is used as a conference room with occupancy ranging from a few persons to as many as 25 persons. Such fluctuation imposed a severe test on the conditioning system. A high power lantern slide projector, which would be used at some conferences, added to the variation in the room heat input. Selection of this room was desirable from an expense standpoint, for to convert to the new air conditioning system it was only necessary to remove the diffuser, turn the duct opening upward to assure equal air distribution, patch the ceiling, and remove pads as required. Details of the acoustical pans are shown in Fig. 2.

Pads to be Removed

Calculation and experimentation determined the location and number of pads to be removed. This calculation involved deciding the number of air changes per hour—in this case 10; establishing a safe air velocity through the holes—300 fpm being selected as a reasonable maximum; and measuring the area of the perforation holes and multiplying by the number per pan to get the open area per pan. To these data it was necessary to apply an orifice factor of 0.5 to figure the number of pans to be removed.*

Tests indicated that for best results in this room the air should be so introduced as to cause a general movement that could be described as a sphere collapsing toward the outlet louver. This general idea of a collapsing sphere dictated that the inlet velocity through the pan perforations should be as low as practical to prevent vortexing and increasing noise in the room. The 300 fpm first chosen as a reasonable maximum for the speed of the air traveling through the perforations was in actual practice reduced to 90 fpm as it was possible to remove many more pads than was at first thought practical.†

In this first room there was some concern that the large volume of the above-ceiling plenum would make the controls sluggish and perhaps even introduce a long cycle hunt. There was no duplicate room, without the above-ceiling plenum, that could be used to study the effect of the plenum. After the room was finished, temperature charts indicated that if sluggishness or hunting was present, it did not produce undesirable conditions. The charts showed a 2F temperature rise when the room was quickly occupied by 20 people and that a half hour was required for the room to return to control temperature. Other charts indicated that there was a 1F change in temperature from floor to ceiling regardless of load.

Two Rooms Similarly Treated

Using the experience gained in the conference room, two other normally troublesome rooms were considered—a classroom and an office-conference room, both with the same physical dimensions as the engineering conference room. In these rooms, the same treatment was used because duplicate conditions, including the above-ceiling plenum, were available. The pattern of pans from which the pads were removed, however, varied somewhat to accommodate different occupancy. In the office-conference room, the maximum number of occupants was estimated at six and, therefore, the changes per hour were reduced and the air was introduced to provide a slow sweep through the room that would eliminate any tendency toward pocketing or short circuiting. In the classroom, a pattern was followed that would drop the air in front of the instructor and move it against the faces of the class, this being the direction from which a flow of air is least readily detected and least objectionable, if noticed. Use of this room for several months, however, has demonstrated that, although serious drafts had been present with standard diffusers, no air movement is noticeable with the new system.

Room with Low Ceiling

The next room that came up for consideration produced a different set of problems for it was a training room with a low reinforced-concrete ceiling that had an exposed 14-inch I-beam running lengthwise at ceiling level. The low ceiling of the room, which had approximately the same area as the ceilings of previously treated rooms, made possible an equal number of changes with less cfm. This, in turn, made it possible to reduce the air velocity through the perforations in the pans to an average of 50 fpm. To provide the feed plenum, a false ceiling was

*Determination for the area in which pads are removed can be expressed as follows:

$$T = \frac{C\ N}{VRF}$$

Where T is the area in square feet of pans from which pads are to be removed; C is the volume of the room, cu ft; N is the number of air changes per minute; V is the velocity of air, fpm, through perforations in the pans; R is the ratio between the area of holes in one pan and the area of the pan, and F is an orifice factor (0.5).

†It should be borne in mind that removal of pads impairs the acoustical quality of a ceiling. Where sound absorption is critical the pads can be supported above the pans by wire.

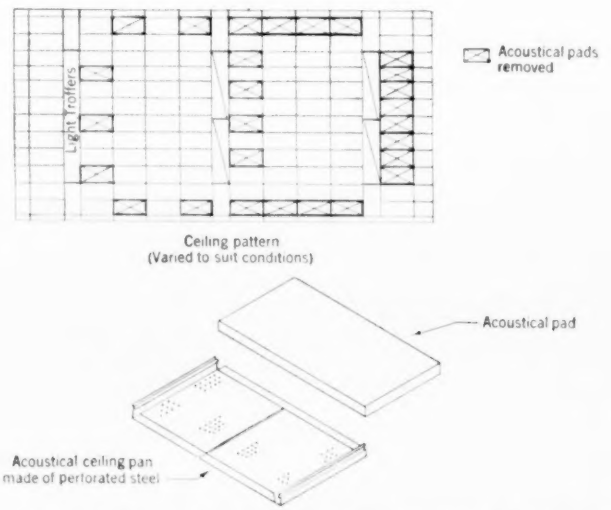

Fig. 2. Details of an acoustical pan and one of the ceiling patterns that was used.

erected just below the beam, which divided the plenum into two parts. For structural reasons it was only practical to bring one duct into the plenum with the obvious difficulty of obtaining equal air distribution. The problem was solved by removing fewer pads per square foot on the side of the beam that was fed by the duct than were removed on the side that had to get its air through the space between the ceiling and the beam. This produced a pressure differential that gave the desired balance.

Pan Perforations

In this room, as in others, it was not necessary to try to conserve air because the air went from the room's discharge louvers into the factory area where it was useful as part of the over-all plant air conditioning. As an experiment, the ceiling pans for this training room were provided with 5/64 inch perforations and, although careful observation was made, no difference in performance was observed over the previous rooms in which pans with 1/16 inch holes were used. The air conditioning controls in this room differ from those of the other rooms because this room takes its air from a single duct system thermostatically controlled by a large manufacturing area. This air supply was not ideal for the comparatively small room, so a volumetric damper, controlled by room temperature, was installed. This worked satisfactorily because the heat load in the manufacturing area always required cool air in the main system. The heat release in the training room was high enough to always provide comfortable conditions within the limits of a reasonable number of air changes. To anticipate a possible change of occupancy, basic provisions were made for installing thermostatically

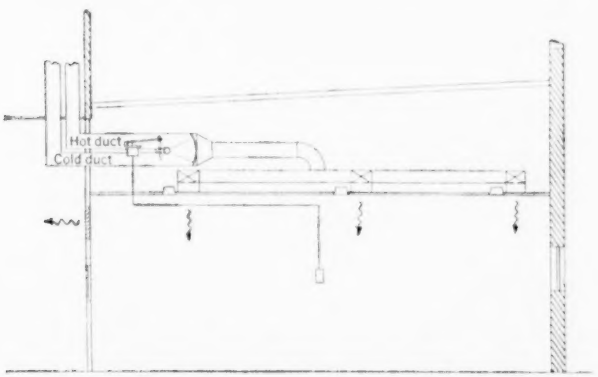

Fig. 3. Sheet metal plenum built over acoustical pans from which pads were to be removed.

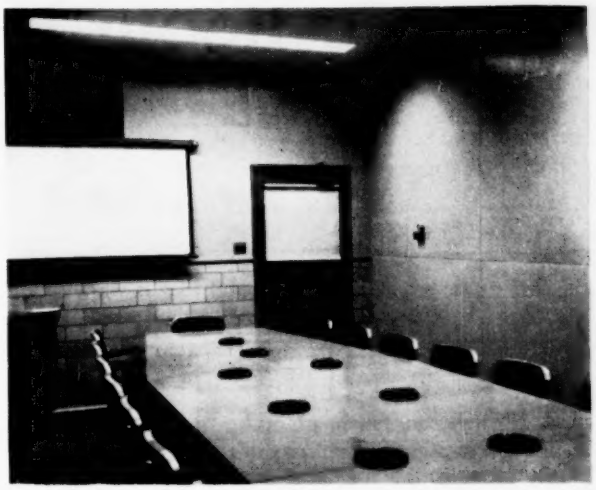

Fig. 4 Conference room which receives air supply through acoustical ceiling. Exhaust louver discharges to main manufacturing area.

controlled steam coils so they were in the incoming duct.

Treatment for Offices

Two other rooms which were modified were offices usually occupied by a single person. They were not adaptable to structural above-ceiling plenums, so a sheet metal plenum was built over the pans from which pads were to be removed, as in Fig. 3. By this time, enough experience had been gained in the design of the pattern through which air was introduced to let the plenums be built with confidence. They were, however, placed and sized to provide for varying arrangements of furniture and occupancy. It was expedient to put the outlet louvers near the ceiling. The possibility of short circuiting which this introduced dictated reducing the amount of air fed near these louvers. In this room it would have been convenient to use a ceiling pattern that left out pads in a center area to permit spent air to escape through the perforated ceiling. This was not done, however, because experience indicated that spent air passing through pans quickly produces a smudge similar to diffuser smudge.

The plant's experience with supplying air through the ceiling pans indicates that success is dependent upon careful design taking into consideration all possible conditions. Air speeds must be kept at a minimum, sensitive controls must be provided, and latitude must be allowed for changing the ceiling pattern in case of changes in occupancy.

Fig. 5. Night view of the Allentown, Pa., plant of Western Electric Co. At the left is the administration building.

Electric Room Heating in Norway

ERIK BJERKESETH

Engineer, Norsk Eswa A/S, Oslo, Norway

Details are presented of an electrically heated radiant panel that is widely used for residential and commercial applications in Norway. Included is a description of how the system is used for church heating.

IN Norway, so much room heating is supplied by electricity, that it is not possible, at present, for power plants to meet this demand. For the 1949-50 heating season fuel used for total heat requirements follows: Wood 35%, electricity 25%, coal products 19%, oil 11%, peat 10%.

Most of this heating by electricity is through the use of heaters in the form of ferrous panels usually placed under windows, and supplying about 1200-1500 watts per square meter (375-477 Btu per hr per sq ft). Pipe-shaped heaters or similar appliances are also used, being placed at the bottom of walls or on floors.

There has also been a steadily increasing demand for radiant heating systems in Norway, mostly of the electric type. Some systems use electric heating cables covered by pipes which are installed where the heating is required. Gaining in attention are those constructed according to the Eswa system which, at present, is practically unknown outside of Norway.

Electric Panels

The simplest type of these Eswa panels, and that most used, consists of two wallboard plates with band-shaped heating elements placed between them. A thin compressed plate is on the room side, with an insulating plate on the studding side. Delivered complete, panels are mounted on a wooden block or some other type of base suitable for nailing. Each panel is fitted with a junction box on one edge for connecting electric circuits. Fig. 1 shows the panels during installation.

Junction boxes lie alongside the wall, and as a rule, boxes and tubes for electric wires are covered by moulding. Panels are supplied either in standard dimensions which are the same as for ordinary wallboard, or they are made according to dimensions required. The latter type are normally used for such applications as offices and apartments. Standard panels are usually used in industrial applications covering large areas. Ceiling systems are constructed for electric power of standard voltage, which in Norway is 220 volts. Voltage for wall and floor systems is much lower, normally 42 volts.

A feature in the use of these panels is that there is an electric element plus heat insulation. Panels with varying insulation may be obtained. The current-conducting element consists of aluminum foil and is attached directly to one of the two wallboard plates.

Application

For heating apartments, ordinary smooth panels are used, while for installations in offices, schools, and industrial premises where there may be objectionable noise, perforated sound-absorbing panels are employed.

Fig. 1. Radiant heating panels being installed.

Fig. 2. First church to be equipped with Eswa system.

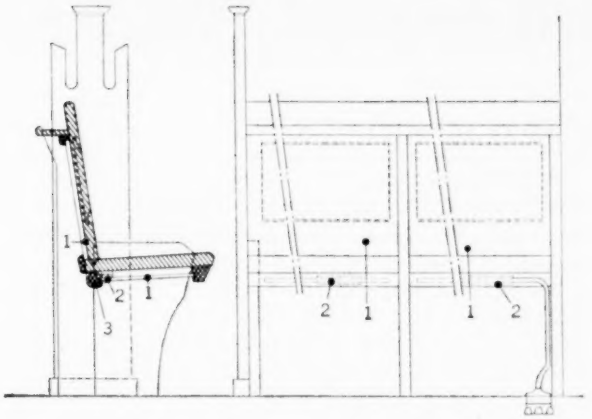

Fig. 3 Example of how panels are fitted to church pews: 1. Eswa panel; 2. Coupling; and 3. tube installation to or between the boxes.

Installations can also be combined with ventilation equipment, so that ventilating air is led in over the upper side of the panels and distributed through perforated sections. The system can then be so arranged that ventilating air obtains the desired degree of preheating directly from the panels. Usually joints are covered with moulding or overhangs during installation. The ceiling can also be smooth or covered with paper.

Ceiling panels are dimensioned for a surface load of about 100-200 watts per square meter (31.7-63.0 Btu per hr per sq ft), depending on room use and ceiling height. In dwellings, where ceiling height is usually about 2.5 meters, (8.2 ft), the surface load does not normally exceed 150 watts per square meter (47.5 Btu per hr per sq ft). Heat requirements determine how large a surface is to be covered with panels. The necessary panels are preferably placed close to the outer walls.

Control Systems

Regulating systems are, as a rule, of two types. For small rooms a system with auto-transformers, which serves a number of rooms, is usually employed. By means of a 3-point switch, voltage supplied to each room can be increased or decreased with corresponding increase or decrease in heating surface temperature. Control switches are placed in accessible locations; in an apartment, usually in the kitchen. This is mainly due to the fact that Norway has an electricity tariff which necessitates avoidance of unnecessary overload peaks. In the kitchen are the electric stove, water heater, and other appliances, so that it is possible to control from here the total electric consumption in the apartment, and to modulate the heating.

Another control system which is often used in large premises, consists of the installation being divided into zones with 3-phase, star connected wiring. Regulation is achieved by disconnecting one phase so the remaining two phases will give half the original heating. In larger rooms, installations are divided into zones which can be individually regulated.

It is common practice to use thermostats directly connected to the circuit. Lately it has become usual to install thermostats on the heating surface, at joints between two panels. Thermostats can also be placed on walls where temperatures are to be regulated. With ordinary room thermostats, temperature fluctuations can be kept within a limit of about one degree.

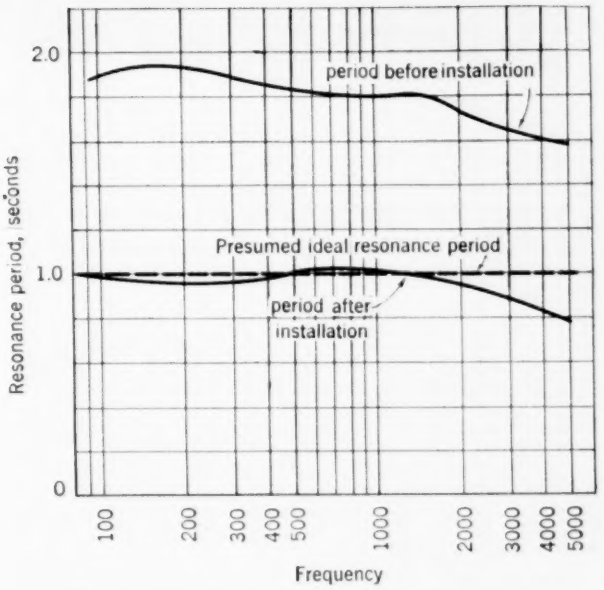

Fig. 4 Acoustic measurements in a classroom.

Church Heating

A special Eswa installation has been introduced for church heating. Fig. 2 shows the interior of a church chiefly heated by means of these panels installed on the pews. Panels have also been used in ceiling installations underneath the galleries.

Panels on pews are placed under the seat of each pew as well as outside the back of the pews. Panels are also constructed to give some warmth to the pew itself.

This system has been tested in a number of churches during two heating seasons. In the church shown in the illustration, the system was selected after a year's trial installation on three pews on one side of the church. Heat output of the panels was 250 watts per square meter (78.4 Btu per hr per sq ft).

Installation in churches is arranged so that the system is divided into zones which can be modulated separately. For smaller gatherings, only a few pews are connected. Fig. 3 shows an Eswa panel on a church pew.

Acoustic Systems

Panels can be supplied as a combined radiant heat and acoustic system. Rigid panels are supplied perforated, with intention for good sound absorption. Fig. 4 shows the results of measurements in a classroom. These tests were made at the request of Oslo Communal Authorities and show the degree of improvement in sound conditions after installation of the Eswa system.

In Norway, cost of Eswa panels is about 60 cents per sq ft for made-to-order systems and about 47 cents per sq ft for standard panels. This price includes installation on a prepared foundation. Sections of ceilings not covered with panels are covered with ordinary panels with the same finish and supplied at standard prices. Electrical installations and connections are extra. Acoustic construction adds a panel cost of about 6 cents per sq ft.

Superheated vs. Saturated Steam

T. W. REYNOLDS

A discussion of steam quality and applications when use of superheated steam is advantageous and when best results are obtained with saturated steam.

AS a general rule, steam condensed by a heating surface should not be superheated for, as it gives up some heat, it then becomes a dry gas which releases its heat slowly. Put another way, the thermal conductivity of superheated steam is low compared with saturated steam, and, as a consequence, its heat will not be transmitted as rapidly to the walls of a tube, pipe, or other heat transfer material.

For example, in a unit heater, superheated steam would deprive the primary tube inner surfaces from the wet contact necessary for maximum heat transfer. In addition, the expansion of superheated steam gives less heat content per cubic foot than with saturated steam at the same pressure, even though the heat content per pound of superheated steam is greater.

Saturated steam when in contact with a cool surface soon gives up most of its heat and therefore quickly condenses, to leave space for more steam; superheated steam must contract before it condenses. The delivery of heat is therefore retarded by the time taken to lose the superheat and to pass through a layer of gas of poor conductivity. Of course, some additional steam is provided to fill up the space left as the steam contracts, but it is only a small amount.

How important an advantage or disadvantage steam superheated or saturated may be depends upon (1) the particular application, (2) the degree of superheat and (3) the dryness or quality of the saturated steam. At the usual degree of superheat, the heat content is only a small proportion of the total steam heat. Therefore, in many cases, but little heat is given up in cooling (although slowly) to a point where all superheat has disappeared and saturated steam forms.

Since most of the total heat is latent heat, the major part of heat transfer takes place at a constant temperature dependent upon the pressure of the steam. Superheated steam cannot exist in the presence of water, so the condensate films on tubes are quickly re-evaporated and the superheated steam soon changes to saturated steam, the time depending upon degree of superheat and the amount of condensate originally present. The thermal effect of using superheated steam is therefore practically the same as with saturated steam.

Effect on Traps

The trap at a unit heater is a good example of where quick removal of condensate is desirable. With saturated steam the trap will have to handle more condensate because of the lesser amount of heat units per pound. If the steam is very wet, condensate is increased not alone by the amount of moisture in the steam, but also by the condensate from the additional steam make-up to provide the full number of heat units contained in saturated steam when dry. Moisture in steam means that the steam is short of latent heat.

For example, that portion of steam which is say 10% wet, is devoid of most heat. Thus, if one pound of dry steam has a total heat of 1,150 Btu and a sensible heat of 180 Btu, then when 10% wet, the total heat will be reduced to (10% $\times$ 180 plus 90% $\times$ 1,150) or 1,053 Btu total heat. It is therefore a relatively heavy burden to carry moisture through a system just for the few sensible heat units it contains.

Any substantial increase in either condensate or moisture requires an increase in the capacity of traps and the number of trapping points. There is also a greater tendency for more steam to be flashed, which steam is often wasted through vents.

A further disadvantage of moisture is the additional thickness of water film the moisture deposits on the heating surface. This thick film, together with any air, acts as an insulator against heat transfer. Compared with steel as a conductor of heat, water is 70 times and air 1,460 times less efficient.

Insulating Films

Air and water insulating films are shown in Fig. 1 and 2 as separate layers, whereas in practice they would exist as a mixture. The thicker these films become, the higher the temperature of steam or temperature drop is required to overcome their resistance to heat transfer. In Fig. 2, to illustrate the point, the thickness of the films on the steam side is arbitrarily taken as one half of the

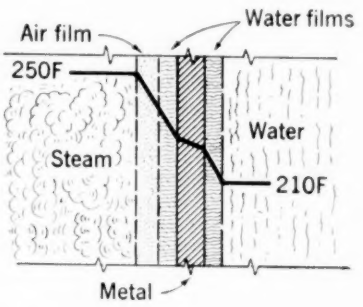

Fig. 1. Temperature drop due to heat resistant films.

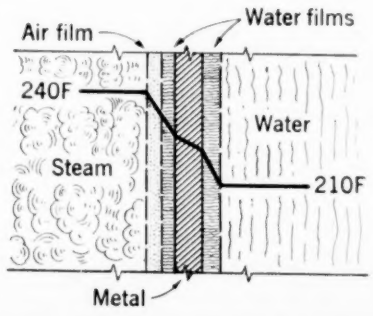

Fig. 2. Reduction of film thickness decreases temperature drop.

same films shown in Fig. 1. As a consequence, the temperature drop through the thinner films will be reduced. This permits a reduction of the initial steam temperature to 240F, Fig. 2, while still maintaining the same final temperature of 210F on the water side. A further advantage is the greater number of heat units in the steam at the lower pressure corresponding to 240F. Conversely, the thinner films permit raising the initial temperature to 250F, if desired, to obtain a higher rate of heat transfer and to shorten the time for a given heat transfer.

Heat and Wear

In any comparison of pipe sizes for superheated steam and for saturated steam, one should weigh the advantage of higher total heat per pound of superheated steam against its greater volume due to expansion. In spite of such considerations, superheated steam can have velocities stepped up about 30%, due to the absence of condensate and pressure drop. This means that with superheated steam in new plants, the steam pipes can be sized somewhat smaller with savings in pipe cost and space required; in old plants the pipes, without reduction in size, can convey more heat and with less pressure drop.

For a given pipe size, the loss of heat may be about the same for steam saturated or slightly superheated. However, in the case of superheat, the heat lost from the pipe is not evidenced by the presence of condensate. If some slight superheat is maintained up to the delivery point, there will be a considerable saving in the number and size of traps and their auxiliary piping. Upon final delivery of the steam free from all superheat and with lowered pressure, the steam will be dry and will have a higher latent heat.

The degree of superheat required to do this will of course depend upon the size and length of the distribution piping. It should therefore be pointed out that in many cases it matters but little whether a pressure reducing valve is placed at the beginning or end of a pipe run, since under most conditions the amount of drying of wet steam is so small that the steam becomes wet again upon further travel through the pipe.

With superheated steam, there is less wear on valves, glands and fittings. For example, saturated steam, particularly when wet, that is expanded through a valve cracked open, is very apt to score or wiredraw the valve seat. The result is grooves as though a wire were drawn repeatedly across the valve seat. Incidentally, superheating by expansion cannot occur with saturated steam at pressures above 450 psia. For example, saturated steam at 750 psia, when passed through a reducing valve, gets wetter down to 450 psia, then gets drier down to about 230 psia (at which pressure it is again dry saturated steam), after which any further expansion superheats the steam.

Plant Efficiency

A properly designed superheater may increase boiler and plant efficiency by reducing the stack temperature due to the superheater abstracting heat from the stack gases, and by increasing the efficiency of the prime movers. All this reduces the work otherwise done by the plant for a given power output, particularly if the boilers are overloaded when operated without a superheater. The life of the boilers will also be increased and boiler maintenance decreased for the boilers, formerly overloaded, can now be operated at lower ratings. It should be pointed out, however, that a high degree of superheat may be necessary in some cases to offset the cost of installation, operation and maintenance of a superheater, unless the increased economy with the superheater reduces the size and number of plant units otherwise required.

Superheated steam seldom pays when used in a process solely for the utilization of its superheat. When, however, the steam can be blown directly into the substance to be heated, both the latent heat and the superheat can be used. In some installations, the superheat can be used in one operation and the latent heat or part of it in a connecting operation. In this event, the saturated steam left after the first operation must contain enough heat for the second operation. Superheated steam can also be used to increase temperature difference where heating surface cannot be added without reducing circulation.

Superheated steam that has direct contact to a process substance will deliver more heat units for a given water addition. If this contact time is too long, the temperature of contacted material may approach that of the superheated steam with results detrimental to the process. With saturated steam, a limit is set by its pressure and the temperature to which the material can be raised.

Steam in Liquids

Superheated steam blown into a liquid may not have sufficient time in its short passage through the liquid to lose its superheat and condense. Therefore, some of the superheated steam breaks through the surface and is wasted. Where this occurs, mechanical exhaust ventilation may be required to remove the heat and mist and in season, heated make-up air may be required.

In any still where the condensation of steam cannot be allowed, superheat may be used to advantage for the superheat permits a higher temperature to be maintained at the point of vaporization.

If the circulation of a process material is sluggish and there is a considerable depth of liquid in the evaporator, it is possible for the lower layers of material to be raised to a temperature considerably in excess of the upper layer. This is due to the hydrostatic head of the liquid exerting a pressure on the liquid in the bottom of the vessel. It might be thought that high temperature on the steam side of the heating surface would increase this danger, but in many cases things work out the other way. With high temperature on the steam side, the higher rate of heat transfer increases the circulation of the boiling substance due to (1) liquid convection currents and to (2) the mechanical agitation of the bubbles of steam acting on the liquid.

This increased circulation greatly minimizes the danger of the bottom overheating because with violent circulation, local stagnation is unlikely. By increasing the rate of flow over the heating surface, the rate of heat transfer is much increased. Heat transfer can be taken as being roughly proportional to the rate of flow over the surface. The fact that the liquid is full of bubbles

clearly reduces its mean specific gravity. A given depth of violently boiling liquid will therefore exert a lower hydrostatic pressure than when boiling sedately.

Heat Transfer in Processes

With superheated steam, heat transfer in a process or other coil follows rather closely the behavior of a dry gas and therefore takes place at a lower rate than when changed to saturated steam farther along in the coil. Although this lower rate is reduced somewhat due to the greater temperature difference with superheated steam, the rate of heat transfer is not equal throughout the coil. This can be detrimental to the process. Another reason for unequal heat transfer at points in a process apparatus is due to the evaporation of moisture in one part of the equipment causing a different rate of heat transfer in this desuperheated portion from that of the superheated portion.

Enormous temperature stresses may be set up by superheated steam at the flange attaching a steam pipe to process equipment. The pipe and flange will be at superheat temperature, the equipment at saturation temperature. Expansion due to superheat must also be properly provided for, especially when temperatures may fluctuate widely.

In some plants it will be found that the steam pressure is reduced and the steam then superheated to obtain the same heat effect as before with the higher pressure. However, all such situations should first be carefully analyzed before going ahead, since steam at lower pressures greatly increases in volume. Pressure drop therefore increases unless pipes are made larger; costs and heat-losing surfaces increase. On the other hand, there are cases where increase in heat-losing surface is offset by the lessened heat transmission at lower steam pressures, especially if the steam at higher pressure was wet and that at the lower pressure is dry.

Gas Heating for the Home

In a talk before the National Association of Home Builders held in Chicago, C. George Segeler, utilization engineer, American Gas Association, spoke on the various uses of gas in the home and measures to avoid trouble in the use of gas. One of the topics covered in his talk was heating the home by gas.

Gas lends itself to the widest variety of house heating methods, a well-known fact although we have not the time today to consider the special problems that might arise as a result of selecting a specific type. Therefore, let us assume that all of us are familiar with each of the 35 different ways of heating a house with gas, such as horizontal or attic furnaces, down flow furnaces, recessed heaters, wall heaters, hot air injection methods, conventional gravity and forced warm air heating systems, radiator heating systems such as steam, one- and two-pipe gravity forced hot water heating, and all of the varieties of radiant floor, radiant panel and sub-floor plenum heating methods as well as gas summer-winter systems.

It looks as though builders will have enough of a problem just to decide what is the best method of heating for their projects. However, all of these systems have many points in common whose correct treatment can readily be discussed to mutual advantage.

First, there must be enough air supply for proper operation. In an ordinary house you anticipate between three quarters and one air change from natural infiltration. This amount of air is ample to supply the needs of gas heating equipment but enclosed utility closets or rooms must have access to this air supply. Therefore two permanent openings freely communicating with the main house space must be furnished. One of these openings should be above the location of the appliance draft hood and one of them should be low, near the the floor. Each of these two openings must be sized with a free area of one square inch for each 1,000 Btu per hour appliance input. Both of these openings must face the same part of the house.

If the house is unusually tight in its construction with few windows well weatherstripped, or if there is likely to be a shortage of building air supply due to the use of a kitchen ventilating fan of larger than usual size, then the openings just referred to should not be used. Instead short ducts or openings should be installed leading to out-of-doors or to attic or crawl spaces. When this is done the one opening should lead to the top of the enclosure and one to the bottom. The size of these openings is figured, as in the previous instance, on the basis of one square inch per thousand Btu input rating. These openings are absolutely necessary so that the utility closet won't become too hot and so that the furnace will have proper air supply.

The upper opening has to connect to an attic space or if a duct is used to out-of-doors, the duct must be pitched upward or at least not below the horizontal. These details may make the difference between success and trouble.

A third problem is occasionally encountered. When appliances are installed in a large space such as a full basement but which is located in a building of unusually tight construction, one opening to out-of-doors must be provided having a free area of one square inch per 1,000 Btu per hour of input rating.

One should always keep one eye open on the kitchen ventilating fan and the attic exhaust fan, particularly if the house itself is tight. The reason is self-evident since the suction which they produce can be great enough in some cases to overcome the draft provided by a chimney or flue, in which case the normal operation of the flue is reversed and a downdraft is set up. It is impossible to expect appliances to operate satisfactorily under such conditions. In a tight house the solution would seem to be to provide the air to the utility closet from the crawl space and attic space rather than to use the conventional openings from the utility closet.

When various "problems" are reviewed in this way it leaves the impression that it is difficult to apply gas heat to a new house. That would be contrary to fact. It must be the easiest way to heat a house according to recent sales reports. Home buyers are continuing to look for the advantages which gas offers. Its adaptability to all kinds of heating arrangements, the simplicity of operating gas equipment, the cleanliness and the quiet associated with its use are among the reasons which prompt the buyer. In fact, as you well know the principal problem of the gas industry is to secure enough gas, enough steel pipe, enough compressor stations to be able to meet the growing demands.

Charts for Refrigeration Design

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Charts simplify the use of two commonly used equations that are part of an ASRE code covering safety for mechanical refrigeration.

TWO equations in ASRE Standard 15-R, Safety Code for Mechanical Refrigeration, get considerable use during system design. These are Equation (1) par. 12.1.5 and equation (3), par. 13.5 of the code. The accompanying charts permit easy, fast solution of these equations and save much time during design, especially when several trial solutions must be made before a final choice is made.

$C = 0.6P_1d^2$, where (1)

C = minimum required discharge capacity of a rupture member or fusible plug for a refrigerant vessel, lb of air per min

P_1 = (for rupture members) bursting pressure, equal to design working pressure, psig

= (for fusible plugs) saturation pressure corresponding to the stamped temperature melting point of the fusible plug, or the critical pressure of the refrigerant used, whichever is smaller, psig

d = minimum diameter of bore of fusible plug

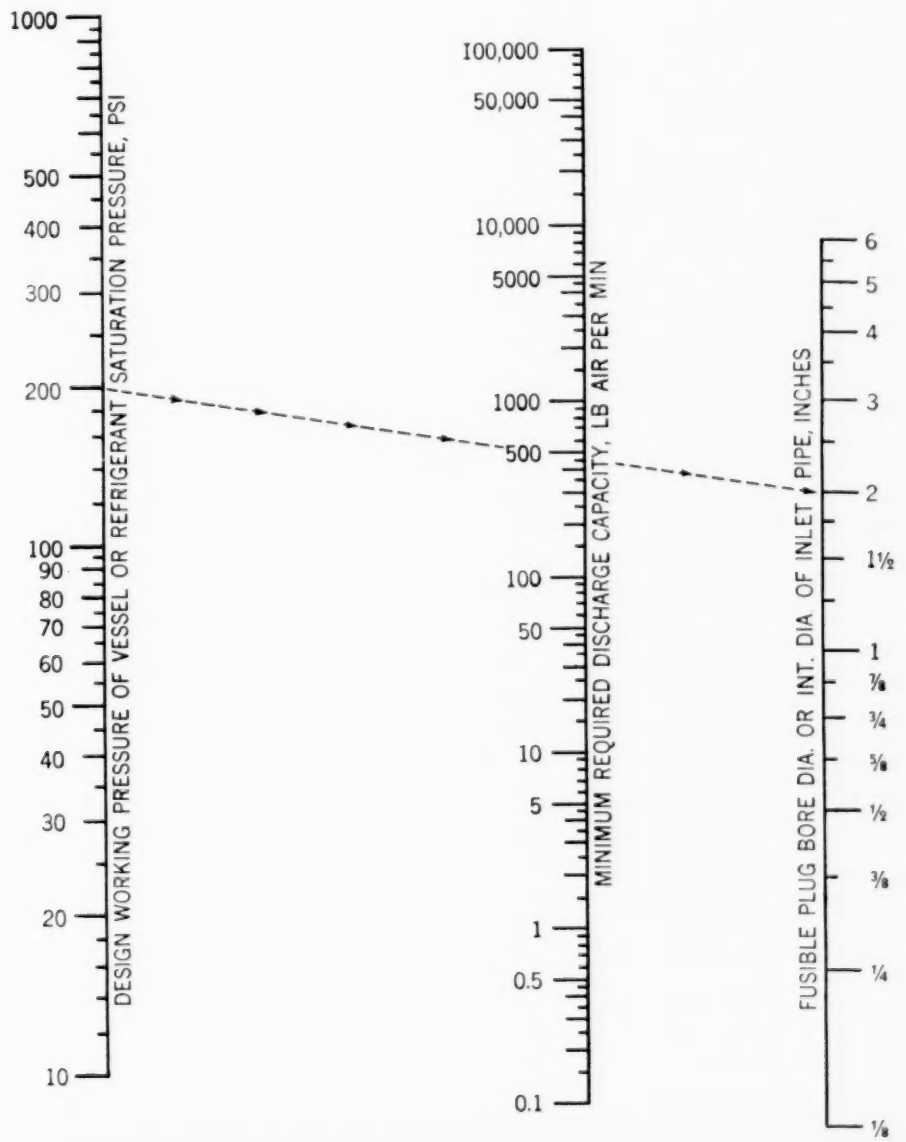

Fig. 1. Chart for solving problems where two of the three variables plotted are known.

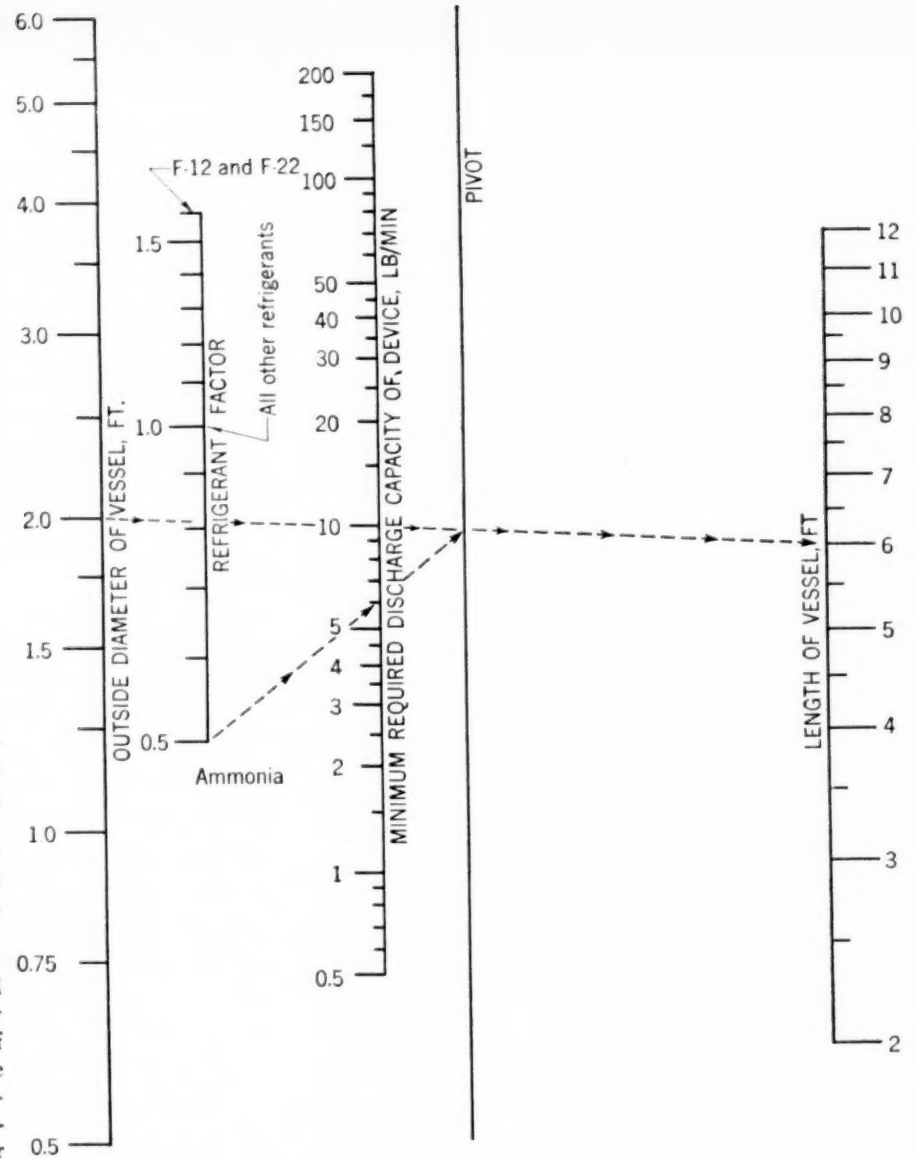

Fig. 2. Chart for solving problems relating to refrigeration design where three of the four variables plotted are known.

or internal diameter of inlet pipe to rupture member, inches.

This equation must be used to check the suitability of either a fusible plug or safety head chosen for a given system.

$C = fDL$, where (2)

C = minimum required discharge capacity of a pressure relief device or fusible plug for refrigerant containing vessel, lb of air per min

D = outside diameter of vessel, ft

L = length of vessel, ft

f = a factor dependent upon kind of refrigerant used. For ammonia, f = 0.5; for Freon-12 and Freon-22, f = 1.6; for all other refrigerants f = 1.0

Note that equation (1) is for relief devices in general whereas equation (2) is for relief devices for pressure vessels.

These charts have been set up for fast, easy use by plant designers. Their utility is best shown by two typical examples.

Problems

Example: What is the minimum required discharge capacity of a safety head (rupture member) if design working pressure of vessel is 200 psig and inlet pipe size of member is 2 inches?

Solution: Enter Fig. 1 on the left at a design working pressure of 200 psig and draw a straight line through the inlet pipe diameter of 2 inches on the right hand scale. At the intersection with the central scale read the minimum required discharge capacity of the safety head as 430 lb of air per min. A member with a capacity of 500 lb of air per min would probably be chosen for this job.

Note that if you know any two of the three variables plotted in this chart you can find the third by following a procedure similar to that detailed.

Example: A refrigerant vessel will be 2 ft in diameter, 6 ft long. What is the minimum required discharge capacity of the safety device if the refrigerant used is ammonia?

Solution: Enter Fig. 2 at the left at a vessel diameter of 2 ft and draw a straight line through a vessel length of 6 ft on the right hand scale. Then from the refrigerant factor, f = 0.5 for ammonia on the second scale on the left, draw a straight line through the intersection of the first line with the pivot line. Read the required discharge capacity as 6 lb of air per min on the third scale.

Note that Fig. 2 may be used to find any one of the four variables if the other three are known.

Heat Loss in Slab Floors

This is an abstract of an article by Neville S. Billington in the Journal of the Institute of Heating and Ventilating Engineers that presents the analysis of heat loss through slab floors as studied by means of an electrical analogue. Effects of size of floor and of insulation are also treated.

LOSS of heat through the ground floor of a large heated building is not generally a large percentage of the total heat requirement. This fact, coupled with the experimental difficulties of measuring the losses which take place through the floor, has resulted in a general neglect of the problem in England. There is thus a dearth of reliable information on which to base any assessment of the transmittance through ground floors of different constructions, shapes and sizes.

Experimental work carried out so far has been confined to the determination of the losses through small floors intended to be representative of dwelling construction. An important omission in this work is that of any attempt to determine the magnitude of the effect of the size of the floor on the heat flow through it.

In addition to the experimental studies, mathematical solutions have been worked out by several authors. Particularly notable is the analytical solution of a somewhat simplified problem given by Macey.

Within recent years, the development of the relaxation method for obtaining numerical solutions, and of the electrical analogue, have placed new tools at the disposal of the scientist and engineer for solving problems involving heat flow in two or three dimensions. This paper gives some results obtained with the network analyzer, a form of electrical analogue. The effects of size of floor, of overall insulation and of edge insulation have been studied; and the dependence of transmittance and heat loss on the temperature difference between inside and outside has been investigated. The data so obtained are compared with the full-scale experimental data and with Macey's theoretical formula. Tables are presented for the estimation of the thermal transmittance of solid ground floors.

The method of determining temperature distributions is shown in Fig. 1.

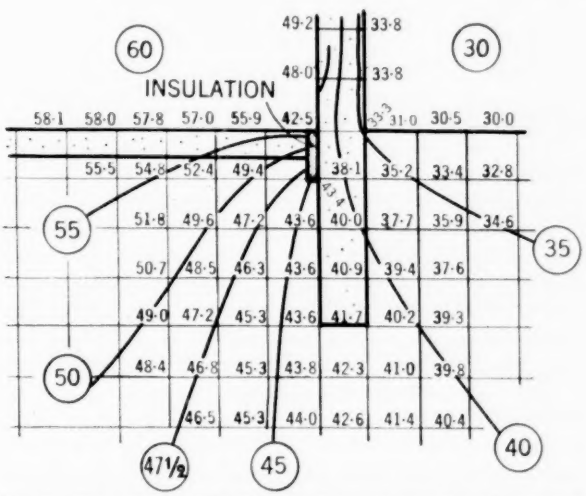

Fig. 1. Temperature distribution diagram at edge of concrete ground floor as determined with a network analyzer.

TABLE 1—HEAT LOSS FROM SOLID CONCRETE FLOORS

Breadth of Floor Between Two Exposed Edges, Inches	Total Heat Loss Through 1.2 ft Wide Strip Btu per hr	Thermal Transmittance U Btu per (sq ft) (hr) (F)	Btu per F, (hr) (F) (ft of edge)*
250	69.6	0.093	0.97
150	63.6	0.140	0.89
90	57.0	0.210	0.79

* Experimental values given for indoor temperature of 60F; outdoor temperature 30F, and earth temperature 45F.

Solid Concrete Floors

It was noted that the temperatures on concrete floor surfaces become progressively lower as the floor is diminished in size. Heat losses through these floors are given in Table 1. Losses are expressed in three ways—the total loss in Btu per hr, the transmittance in Btu per (sq ft) (F), and the perimeter loss factor (F_2) in Btu per (hr) (F) (ft of exposed edge).

Experiment shows that the thermal transmittance, U, increases as the floor is made smaller, the total heat loss varying slowly with the size of the floor. The heat flow may be thought of as consisting of two approximately independent components—the central loss, independent of temperature difference, and the edge loss—and the latter is generally much the larger of the two. The heat flow thus depends more on the edge loss than on the total area, and this can explain the variation of U with temperature difference. It has been suggested that since most of the loss takes place through the exposed edge of the floor, it would be more logical to compute the loss by reference to the length of this edge. This figure is given in the table in the column headed F_2, and is equal to the total hourly loss per degree difference of air temperature, divided by the length of the exposed edge.

Insulation

It is of importance to see how far the floor losses can be reduced by suitable thermal insulation of the structure. The temperature distribution diagrams showed that the floor surface temperature is raised everywhere by the

TABLE 2—EFFECT OF EDGE INSULATION ON HEAT LOSS

Breadth of Floor Between Two Exposed Edges, Inches	Depth of Edge Insulation, Inches	U Btu per (sq ft) (hr) (F)	F_2 Btu per (hr) (F) (ft)	Reduction in U or F_2 per cent
250	0	0.093	0.96	..
	10	0.088	0.91	6
	20	0.085	0.88	9
	40	0.079	0.81	15
90	0	0.210	0.79	..
	10	0.198	0.74	6
	20	0.182	0.68	14
	40	0.163	0.61	23

Indoor temperature, 60F; outdoor temperature, 30F; earth temperature, 45F.

application of insulation. In particular, the temperature near the edge of the floor is appreciably increased. This fact has an important bearing on the feeling of warmth experienced by persons using the floor, and on the incidence of condensation.

From what has been seen of the small heat flow through the center of the floor, it is apparent that insulation over the middle has relatively little value. Instead, it is preferable to place the insulation at the points of maximum heat flow, i.e. at the edge of the floor, and so prevent direct transmission through the footings of the wall. This has been shown in full-scale tests to have considerable value. In the study with the analyzer, the limiting value of edge insulation has been determined by definitely preventing lateral flow from the edge of the floor and through the ground immediately adjacent to the footings of the wall. The results are shown in Table 2.

Edge insulation, therefore, can be just as effective in reducing the heat loss as is overall insulation. This being so, economy suggests that edgewise insulation is to be preferred, although it may introduce some constructional difficulties from which overall insulation would be free. Edge insulation is also effective in raising the surface temperature of the floor adjacent to the base of the wall, as can be seen from Table 3.

TABLE 3—TEMPERATURES OF FLOOR SURFACES

Depth of Edge Insulation, Inches	Surface Temperature, F, at Edge of Floor 250 Inches Wide
0	44.6
10	55.8
20	57.2
30	58.2
40	58.3

Indoor temperature, 60F; outdoor temperature, 30F; earth temperature, 45F.

Temperature Differences

As it has been said that the heat flow through a ground floor is made up of the edgewise loss and the ground loss, it is important to consider how the total heat loss depends on the indoor-outdoor temperature difference and on the earth temperature.

The dependence of U on the air-to-air temperature difference, when the outdoor temperature varies while the indoor temperature and earth temperature remain constant, is seen when the transmittance increases as the outdoor temperature rises. This is to be expected since part of the heat flow—that through the middle of the floor—remains constant under these conditions. The total heat loss naturally decreases as the outdoor temperature increases; but it is not zero even when the indoor and outdoor temperatures are equal, save in the special case when these are also equal to the earth temperature.

The effect of variation of earth temperature is indicated, as a reduction in earth temperature causes a small increase in heat loss and thermal transmittance.

A tabulation and analysis of floor U values in regard to floor dimensions and areas, for insulated and uninsulated cases, compared the network analysis to results of calculations performed using Macey's formula. Agreement was close but admittedly fortuitous.

Abstract of Paper on Ventilating Jets

At the last annual ASHVE meeting, G. L. Tuve, professor of mechanical engineering, Case Institute of Technology, proposed methods for determining the velocity patterns along the jet axis, the velocity profile at any cross section in the fully turbulent zone, and the angle of divergence. In his paper, Air Velocities in Ventilating Jets, Prof. Tuve presented experimental data for both axial and radial annular jets and for air streams flowing along a wall.

According to Prof. Tuve, the most common questions, stated in general terms, to which ventilating engineers need answers for design purposes are:

How far does the jet travel or what is the growth?

What is the shape of its spread or coverage?

How can the velocity at any selected point within the jet be determined?

He said, "Cross sectional velocity profiles are obtainable with engineering accuracy by a simple form of the probability curve when the jet angles are assumed from reported data. A jet discharged along a wall or ceiling behaves like one-half a symmetrical jet and the maximum velocity occurs very close to the surface. Hence the throw and spread of such a jet are greater than those of a free jet."

Since the procedures outlined are based on several approximations, it was suggested that more accurate methods be sought through further research in this field of ventilating jets.

Flow and Fan—

Principles of Moving Air through Ducts

C. HAROLD BERRY

Gordon McKay Professor of Mechanical Engineering, Harvard University

Part 6. The System Considered as a Whole

Following detailed analysis of component losses in the first 5 parts of this 12-part series, the discussion now turns to the fan and its relation to the system through which it maintains flow.

IN ANY combination of fans and ducts, it is convenient to consider the fan or fans by themselves, as the means whereby flow is maintained, and the rest of the combination as the *system* through which flow is maintained.

The system will comprise ducts, together with diverse apparatus through which air or other gas is to be passed.

The fan or fans may be located at the entrance end of the system (blower or forced draft fan) or at the exit end (exhauster or induced draft fan) or at intermediate points (booster) or in any two or all three positions.

Whatever the arrangement, air (or other gas) comes from the atmosphere (or from a large chamber) where the velocity is zero (or virtually so) and is finally discharged to the atmosphere (or to a large chamber) where the velocity is again zero.

Bernouilli's equation for the entire combination is

$$h_{v1} + h_{s1} = h_{v2} + h_{s2} + h_{L\,1,2} - W_{1,2} \qquad (130)$$

where $W_{1,2}$ is the work delivered by the fan or fans in sustaining the gas flow. (The equation is conventionally in inches of water; pressure has the dimensions of work per unit volume.) With initial and final velocity zero, we have

$$W_{1,2} = h_{L\,1,2} + (h_{s2} - h_{s1}) \qquad (131)$$

that is, the work required of the fan must equal the sum of all the system losses plus any rise in static pressure between entrance and exit.

System Losses

As has been remarked before, the sum of the system losses is computed from zero velocity to zero velocity, and hence the exit velocity pressure must be counted as a loss. The entrance velocity is set up at the expense of the static pressure of the atmosphere, but this entails no loss because the kinetic energy of the fluid is available in the duct system and can be reduced (in an expanding duct) so as to give an increase in static pressure. Losses result from friction and shock, but velocity pressure is not lost—not yet. Finally the exit is reached. By an expanding duct the exit velocity may have been reduced, but it cannot be zero. The residual kinetic energy is beyond recovery; it is a loss. We have previously seen that the exit static pressure must equal the static pressure in the region to which fluid is discharged; thus the exit total pressure ($= h_{sx} + h_{vx}$) in the end of the duct exceeds the total pressure ($= h_{sx} + 0$) in the discharge region. The excess is frittered away in stirring up the surrounding fluid, and is lost. This is the loss due to abrupt expansion from the discharged stream to zero velocity in the region receiving the discharged fluid.

The rise in static pressure between entrance and exit is not to be charged against the system; it is not a loss. It is analogous to the increase in elevation head when water is pumped into a high-level reservoir. Gas may be delivered into a gas-holder that maintains a pressure higher than that at the entrance to the system. A second duct system may conduct gas from the holder and finally discharge it to the atmosphere; the rise in static pressure will be negative, and may suffice to balance the losses so that $W_{1,2}$ will vanish (equation 131) and no fan will be needed in the second duct system.

In many cases, such as ventilating systems, the overall change in static pressure is zero, and the work required of the fan must equal the sum of the system losses, as we have already noted in Part 2 of this series.

System resistance is another name for the sum of the losses plus the rise in static pressure ($H_s = h_L + \triangle h_s$). Now that we have considered losses in some detail, we are in a position to study the variation of system resistance as a function of the volumetric rate of flow, Q, cfm.

For flow in the turbulent region (Reynolds number above 2000) we have seen that each individual loss is proportional to the square of the velocity or (for abrupt expansion) to the product of a velocity by a velocity drop. Since, from the equation of continuity, $Q = AV$, we conclude that in the turbulent region each loss is proportional to Q^2, and obviously the sum of all such losses will also be proportional to Q^2. That is, Turbulent Loss $= aQ^2$, and the loss increases exponentially with Q, as shown in the parabola, Fig 39 (A).

For flow in the viscous, laminar, stream-line region (Reynolds number below 2000) we have mentioned that the loss is proportional to the velocity. That is, Viscous Loss $= bQ$, and the loss rises in a straight line relationship with Q, as in Fig. 39 (D).

In the second article of this series (Heating and Ventilating Magazine, February, 1953, page 98) it was pointed out that if the Reynolds number (equal to 100 D V for normal atmospheric air) is less than approximately 2000 the flow will be laminar and the resistance will be proportional to the velocity, not to its square. In this region of low flow the resistance will be represented by a straight line, not a parabola. Now we say that for any duct system with turbulent flow the system resistance curve is a parabola. But as the flow decreases toward

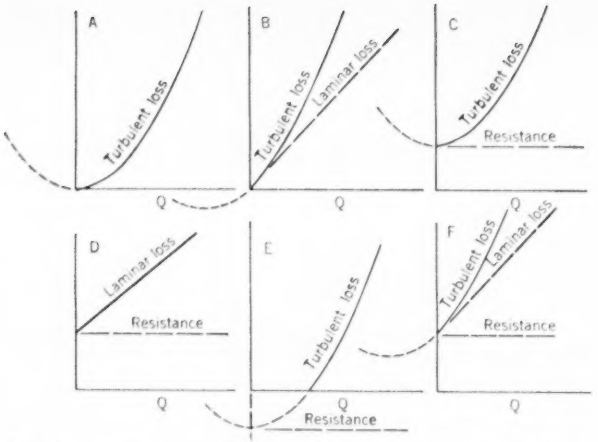

Fig. 39. Various system situations with respect to friction losses and the introduction of a constant resistance.
(A) Pure turbulent friction.
(B) Combined turbulent and laminar friction.
(C) Turbulent friction plus constant resistance.
(D) Laminar friction plus constant resistance.
(E) Turbulent friction with a negative constant resistance, that is, a drop in static pressure from entrance to exit, as in flow from a gas holder.
(F) Turbulent friction, laminar friction, and constant resistance, all three in one system.
Broken line continuations of the turbulent loss curve are merely to locate the apex of the parabola, not to suggest either negative loss or negative Q.

zero, so also must the Reynolds number, and it will therefore fall below 2000 somewhere on the way. Below this point the parabola does not give a proper representation of the resistance. A few numerical values indicate that for a duct one foot in diameter this transition occurs when the flow rate is 16 cfm and for a duct five feet in diameter 80 cfm. It seems evident that for any reasonable scale of plotting these flow rates would be so close to zero as to be imperceptible to the naked eye. Accordingly we draw the parabola and use it notwithstanding we know that for a tiny region adjacent to the origin this curve is not correct.

There is another possible element of system resistance that has not been mentioned thus far. In some process equipment gas is bubbled through a body of liquid as in the aeration of sewage. Gas flow cannot begin until the gas pressure is high enough to overcome the hydrostatic head of liquid. The fan must maintain this pressure plus losses. This element of system resistance is like the rise in static pressure between entrance and exit, except that it can never be negative. In particular, the overall change in static pressure and the hydrostatic bubbling resistance are independent of the rate of gas flow. They combine to give us, Constant Resistance = c, a perfectly flat line in a graph of resistance against Q, as is shown in Fig. 39 (C).

Adding the three elements of system resistance gives the whole story.

$$\text{System Resistance} = H_s = aQ^2 + bQ + c \qquad (132)$$

The coefficients a and b can never be negative. The constant resistance c may be negative if it is (or is dominated by) a drop in static pressure between entrance and exit. The coefficient a would be zero for a system with viscous flow throughout, but this would be a most unusual system; we may safely say that a is never zero, since friction is always with us and gas-flow systems, at least in part, operate at high Reynolds number. The coefficient b will be zero in the absence of laminar flow.

For the usual system, such as a ventilating system, b and c are zero. For an air-conditioning system including a filter of the cloth or paper type, c will be zero, but both a and b will be positive. For a Bessemer converter, b will be zero, a will be positive, and c will be positive and large (air bubbling through a bath of molten iron perhaps three feet deep). For flow from a gas holder (as in any city gas system) c will be negative and both a and b may be significant, because there will certainly be turbulent flow in parts of the system, and there may be viscous flow in other parts.

Whatever the situation, the curve showing the relationship of equation (132) will be a parabola with vertical axis. Various system situations are shown in Fig. 39.

This curve, whatever its form, is called the *system characteristic* or the system parabola. For any system, this curve shows the total system resistance for any rate of flow.

For a simple system, with only turbulent friction losses (aQ^2), the vertex of the parabola is at the origin, as in Fig. 39 (A), and a single point defines the parabola. One has merely to find the system losses for a single convenient value of Q, and the entire curve can be plotted easily from pairs of values taken from a single setting of slide-rule scales A against C.

If the system includes both turbulent and viscous losses ($aQ^2 + bQ$) two points are required. The total loss must be computed for two convenient values of Q, whereupon the coefficients a and b can be found and the curve can be plotted over any chosen range of Q values. Similarly if the system includes turbulent (or viscous) friction together with constant resistance, two computed values will fix a and c or b and c.

For a system including all three types of loss, it will be necessary to compute the total loss for three values of Q to find the three coefficients and plot the complete curve.

One may think of the system characteristic in purely graphical terms. It consists of a parabola of which the shape or "spread" is fixed by the turbulent resistance. The parabola has a vertical axis. In the absence of viscous friction the axis of the parabola is the axis of zero Q, and the vertex is above or below the origin by the amount of the constant resistance, if any. If there is viscous resistance, it determines the slope of a straight line, and the parabola must be shifted to the left and down so that it is tangent to this line at its intersection with the axis of zero Q.

In terms of the coefficients of equation (132), we may express the "spread" and location of the parabola as shown in Fig. 40.

Changing the System Resistance

Thus far we have assumed that the system is fixed (that the coefficients in equation (132) are constants). This is not always the case. In order to vary the rate of flow, we often wish to vary the resistance of a system, and this is easily done by adjusting a damper. In other cases the resistance of the system will vary due to the accumulation of dust on a filtering medium or of slag on boiler tubes or of solid material in a horizontal duct in a pneumatic

conveying system. Further, the constant resistance may change by the pumping up or running down of a gas tank or by change in the liquid level in a bubbling process.

A change of turbulent friction changes *a* in equation (132); an increase gives a narrower and steeper parabola, the position of which shifts so that it remains tangent to the viscous friction line at Q = 0; or, with no viscous friction, the parabola vertex is located by the constant resistance (which may be zero). A change of the viscous resistance changes the slope of the inclined line to which the parabola must be tangent, and hence shifts the parabola left and down or right and up. A change of the constant resistance shifts the curve vertically.

Thus a given system may have a whole family of characteristic curves, with parameters fixed by the setting of a damper, the accumulation of dust or solid matter, the level of liquid in a bubbled bath, or the like.

In the simple case without viscous friction or constant resistance, the system characteristics reduce to a family of parabolas with vertex at the origin. Any increase in resistance narrows and steepens the curve.

The System Resistance and Pressures

Consider a duct system served by a fan at the entrance end (a blower). Write Bernouilli's equation from the fan discharge (the system entrance) to the atmosphere into which the system discharges.

$$h_{s1} + h_{v1} = h_{s2} + h_{v2} + H_s \qquad (133)$$

where H_s is the total system resistance. There is no work term in the equation because there is no fan; we started beyond the fan.

But at point 2, in the open atmosphere, the total pressure is zero

$$h_{s2} + h_{v2} = 0 \qquad (134)$$

and therefore

$$h_{s1} + h_{v1} = h_{t1} = H_s \qquad (135)$$

The total pressure developed by the fan must equal the system resistance.

Again, consider a duct system with a fan in an intermediate position (a booster). We may write Bernouilli's equation from point 1 in the atmosphere ahead of the entrance to point 2 at the fan suction, and from point 3 at the fan discharge to point 4 in the atmosphere beyond the discharge.

$$\left.\begin{aligned} h_{s1} + h_{v1} &= h_{s2} + h_{v2} + H_{sb} \\ h_{s3} + h_{v3} &= h_{s4} + h_{v4} + H_{sa} \end{aligned}\right\} \qquad (136)$$

where H_{sb} and H_{sa} are the portions of the system resistance before and after the fan. As always, at 1 and 4 in the atmosphere, total pressure is zero.

$$h_{s1} + h_{v1} = 0 = h_{s4} + h_{v4} \qquad (137)$$

Adding equations (136) and (137) gives

$$(h_{s3} + h_{v3}) - (h_{s2} + h_{v2}) = H_s \qquad (138)$$

The total system resistance equals the total pressure developed by the fan.

If the system is served by a fan at its discharge end (an exhauster) a somewhat different situation arises. We start, as before, with Bernouilli's equation from point 1 in the atmosphere ahead of the entrance to point 2 at the fan suction

$$h_{s1} + h_{v1} = 0 = h_{s2} + h_{v2} + H'_s \qquad (139)$$

$$h_{t2} = -H'_s \qquad (140)$$

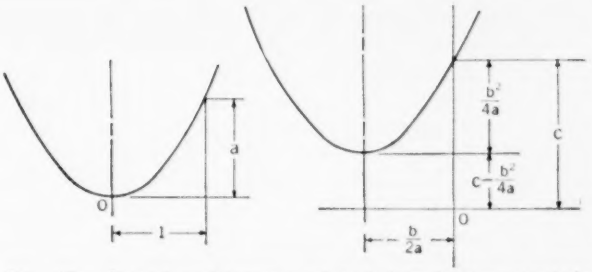

Fig. 40. Spread and location of turbulent friction parabola in terms of coefficients of equation (132). The vertex of the parabola is located by differentiating equation (132) and equating the derivative dH/dQ to zero.

In this case, the system resistance, H'_s, does not include the velocity pressure h_{v2}, because it has not been lost; it is passed along to the fan.

The total pressure developed by the fan equals the rise in total pressure from point 2 at the fan suction to point 3 *in* (not beyond) the fan discharge.

$$\text{Fan total pressure} = (h_{s3} + h_{v3}) - (h_{v2} + h_{s2}) \qquad (141)$$

Substitution from (139) gives

$$\text{Fan total pressure} = (h_{s3} + h_{v3}) + H'_s \qquad (142)$$

As we have mentioned often, the static pressure in the fan discharge must be zero, because the fan discharges directly to the atmosphere, $h_{s3} = 0$, hence

$$\text{Fan total pressure} = H'_s + h_{v3} \qquad (143)$$

The total pressure developed by the fan must equal the system resistance without the loss of duct velocity pressure plus the velocity pressure in the fan discharge. How can this be computed? Presumably we have designed the entire duct system, and found the losses in all of its parts, so that H'_s is known. But h_{v3} (the velocity pressure in the fan discharge) cannot be found until the area of the fan discharge is known, and this depends upon the size of the fan which has not yet been selected. So it is convenient to modify equation (143) to a more convenient form.

$$(\text{Fan total pressure}) - h_{v3} = H'_s \qquad (144)$$

The total pressure developed by the fan and the velocity pressure in the fan discharge are both characteristics of the fan that are known for a stated rate of flow. We combine them in the definition of another fan characteristic

$$(\text{Fan total pressure}) - h_{v3} = (\text{Fan static pressure}) \qquad (145)$$

Fan static pressure is defined as the total pressure rise developed by the fan, minus the velocity pressure in the fan discharge. Then equation (144) becomes

$$\text{Fan static pressure} = H'_s \qquad (146)$$

For a fan operating as an exhauster, the fan static pressure must equal the system resistance without the loss of duct velocity pressure.

This matter has been mentioned before. It is hoped that a second more detailed approach may make it clearer.

Some systems are served by two fans, a blower and an exhauster. The commonest case of this sort is the steam boiler and furnace, with both forced-draft and induced-draft fans. In such cases it should be evident that the sum of the total pressure developed by the forced-draft fan plus the fan static pressure of the induced-draft fan must equal the system resistance without the loss of exit velocity pressure, or,

$$H_{tf} + H_{si} = H_s - h_{vx} \qquad (147)$$

But there is another way to compute a two-fan system of this sort. The forced-draft fan develops a pressure exceeding atmospheric at the entrance to the system and the induced-draft fan develops a pressure less than atmospheric at the system exit. At some intermediate point the system pressure (static or total) must be zero (i.e., atmospheric). We are free to locate this point arbitrarily. (It is often called the balance point; the system is often said to operate with balanced draft). Having decided where zero pressure is to be, we compute the system loss upstream and downstream of this point, and equate the total pressure developed by the forced-draft fan to the upstream loss, and the fan static pressure of the induced-draft fan to the downstream loss excluding the duct velocity pressure.

This case may be further complicated by the fact that the induced-draft fan often discharges through a tall chimney with friction loss and also with pumping effect (natural draft). This transfers the loss of velocity pressure to the top of the stack. Between the point where air enters the furnace and the top of the stack there is a large drop in static pressure. Accordingly the equation covering the situation becomes: Total pressure developed by forced-draft fan plus total pressure developed by induced-draft fan plus drop in static pressure between (air entrance to furnace) and (top of stack) equals total system resistance including loss of velocity pressure at top of stack plus increase in the elevation term $h_z = \rho z$ for the flowing gas. That is,

$$H_{tf} + H_{ti} + (h_{s1} - h_{sx}) = H_s + \triangle h_z \qquad (148)$$

Compare equation (131) where the overall difference in static pressure appeared. Earlier it seemed expedient to include the difference in static pressure as a constant element in the total system resistance. This would transpose the static pressure drop from the left to the right side of equation (148) which would not affect its validity. The best disposition of a question of this sort depends upon the point of view that dominates the particular problem in hand; we may consider the drop in static pressure as a pumping effect of the chimney, to be included with the fan work, or as a negative element of system resistance that reduces the duty required of the fans.

It should be remarked that in this case of boiler furnace and chimney it is important to follow the "rigid rule of action" stated in Part 1 of this series. It will be noted that equation (148) does this through the inclusion of the static pressure drop and the elevation term h_z. As pointed out, these two terms must always enter together.

The drop in static pressure is computed as explained in Part 1, of course using a proper value for the density of the atmosphere under prevailing conditions. More might be said, but probably this is not the place for further discussion of this special application.

System Power

Equation (131) asserts that the fan work equals the system resistance. Further, it has been remarked that pressure has the dimensions of work per unit volume. Pressure in psf equals work in ft-lb per cu ft of fluid. Thus the system resistance may be regarded as the work required per cubic foot of gas. This makes it easy to compute the power required to maintain the flow of Q cfm through a system where resistance is H_s inches of water.

$$\text{Power (ft-lb/min)} = 5.19\ H_sQ \qquad (149)$$

$$\text{System Horsepower} = \frac{5.19\ QH_s}{33000} = \frac{QH_s}{6350} \qquad (150)$$

$$= 0.0001575\ QH_s \qquad (151)$$

The divisor 6350 might be argued; 33000/5.19 = 6358 and 33000/5.2 = 6346; 6350 is a fair compromise and its implied accuracy of 1 in 600 in much better than our measurements in this field.

The system horsepower is the power that must be delivered to the gas to maintain flow at the rate Q through a system of resistance H_s at the rate Q.

Equation (132) gives the system resistance

$$H_s = aQ^2 + bQ + C \qquad (132)$$

The system horsepower is then

$$P_s = \frac{aQ^3 + bQ^2 + cQ}{6350} \qquad (152)$$

For systems for which b and c are zero, i.e., for simple ventilating systems and their like, the system power curve is a cubical parabola, power being proportional to the cube of the rate of flow. For more complex systems the power curve is more involved. It is not worth discussing, since it is easily computed point by point from the H_s curve in any actual case.

A more detailed method of reaching the same result may be helpful to some readers (and boring to others).

When a force acts upon a body that moves in the direction of the force, we say that work is done, and we give this a quantitative meaning by the definition

$$\text{Work} = \text{Force} \times \text{Distance} \qquad (153)$$

We define power as the rate of work development per unit time, and hence

$$\text{Power} = \text{Force} \times \text{Velocity} \qquad (154)$$

The English work unit is the foot-pound, the work done in lifting one pound one foot, and the unit of power is the horsepower, 33000 ft-lb per min or 550 ft-lb per sec.

Within a stream of gas flowing through a duct there is always pressure acting, the static pressure. The gas behind is pushing on the gas before. The gas is moving, so that the force is moving, advancing upon the gas before, retreating from the gas behind. The gas behind is delivering work to the gas before at a rate fixed by the pressure and the velocity. There is a flow of power downstream.

$$\text{Power} = \text{Force} \times \text{Velocity} \qquad (154)$$

$$= \text{Pressure} \times \text{Area} \times \text{Velocity} \qquad (155)$$

$$= \text{Pressure} \times \text{Volume per unit time} \qquad (156)$$

For pressure, h_s, in inches of water, and volume Q in cfm,

$$\text{Horsepower} = \frac{h_sQ}{6350} \qquad (157)$$

At every point along the stream, this power is being expended by the gas behind upon the gas before.

Consider a portion of a stream of gas, between points 1 and 2. At the upstream point, 1, power enters at the rate $h_{s1}Q/6350$, and at the downstream point, 2, power leaves at the rate $h_{s2}Q/6350$. Under our assumptions Q is constant, so that the gas in the region between points 1 and 2 must be delivering power to the rest of the flowing stream at the net rate

$$(h_{s2} - h_{s1})Q/6350 \qquad (158)$$

But this power cannot appear from nothing; the gas be-

tween 1 and 2 must receive this power from outside sources. This is the power supplied to sustain motion.

At the same time, a unit mass of gas, as it passes from 1 to 2, may undergo a change in velocity $(V_2 - V_1)$, and the acceleration can only be produced by a moving force which does work. The work received by the gas equals the increase in its kinetic energy, or (with due consideration for units) the increase in its velocity pressure.

$$(h_{v2} - h_{v1})Q/6350 \qquad (159)$$

This is the power required to accelerate the gas.

Power to move and accelerate must be the sum of the two foregoing items

$$[(h_{s2} + h_{v2}) - (h_{s1} + h_{v1})]\ Q/6350 \qquad (160)$$

$$= (h_{t2} - h_{t1})Q/6350 \qquad (161)$$

We might go further and consider the power required for lifting the gas to a higher elevation, but this can easily be added in special cases where it is needed.

If the *duct* between 1 and 2 has nothing to deliver power to the gas, the final total pressure will be smaller, and the drop in total pressure will be what we have already defined as the system resistance between 1 and 2. The power received will be negative, and will be the power expended in overcoming friction and shock losses. This is the *system horsepower* as given by equation (150).

If points 1 and 2 enclose a *fan* which delivers power to the air, the total pressure at 2 will be larger, and the power of equation (161) is positive; it is the *air horsepower* of the fan, i.e., the power delivered to the air by the action of the fan.

A complete installation will include both fan and duct system. If it is a simple ventilation system receiving from and discharging to the atmosphere, the initial and final total pressures will be zero, and the net power will be zero, which requires that the air horsepower of the fan equal the system horsepower of the duct and other equipment through which flow is maintained.

Static Horsepower

We have seen that when a system is served by an exhauster, it is convenient to compute the system resistance excluding the final velocity pressure, and to express fan performance in terms of the fan static pressure. If we use these terms in the foregoing mathematical expressions we secure the *system static horsepower* and the *fan static horsepower*, which must be equal. These static horsepower values exclude the power required to accelerate the gas tc the velocity prevailing in the fan discharge, and are therefore fictitious, since gas cannot be set in motion without acceleration. Notwithstanding their fictitious nature, these values are useful for exhaust systems, but one must be careful to avoid misusing them under other conditions.

$$\text{System Static Horsepower} = H'_s Q/6350 \qquad (162)$$

$$\text{Fan Static Horsepower} = [(h_{t2} - h_{t1}) - h_{v2}]\ Q/6350 \qquad (163)$$

Variations of System Resistance and Power with Flow and Fluid

[*The discussion which follows makes use of the method of dimensional analysis and assumes some knowledge of that method on the part of the reader. Even without such knowledge conclusions will be clear. The method is a useful one and is fully and clearly set forth in relation to fluid properties, in Fluid Flow in Pipes, by Clifford H. McClain, The Industrial Press, 1952.*]

Through a given system we may pass any kind of fluid (gaseous in our present study) at any rate of flow. The system resistance and power will depend upon the rate of flow Q, and upon the properties of the fluid, i.e., density ρ and (in the laminar region) viscosity μ. We may readily find the desired relations by dimensional analysis, but in order to do this we must include all pertinent variables; we must add a linear dimension to define the size of the system. The idea is that a change in the size of the system will surely effect a change in resistance and power. Dimensional analysis contemplates a system represented by a drawing that may be interpreted in terms of any desired scale, so as to produce a group of geometrically similar systems in which all dimensions are in fixed ratios each to each, and all angles are identical.

As the single linear dimension that fixes the size of the system, let us take the diameter D at some chosen point as in Fig. 41; all other dimensions (lengths and diameters) must be proportional to the value of D.

For such a family of similar systems, then, H_s (*or* H'_s) and P_s are determined by Q, D, ρ, μ.

We have already remarked that, *in the turbulent region*, the influence of viscosity is negligible. Friction and acceleration forces dominate. We have three independent variables, Q, D, ρ, and three fundamental dimensions, mass M, length L, and time T. (We might equally well use force, length, time, but this presents no advantages.)

$$H_s = kQ^a D^b \rho^c \qquad (164)$$

H_s, be it remembered, is fundamentally a pressure drop, force per unit area. The dimensional equation is therefore

$$[ML^{-1}T^{-2}] = [L^3T^{-1}]^a\ [L]^b\ [ML^{-3}]^c \qquad (165)$$

Equating the exponents for M, L, T gives

$$\left.\begin{aligned} [M]\quad 1 &= c \\ [L] - 1 &= 3a + b - 3c \\ [T] - 2 &= -a \end{aligned}\right\} \qquad (166)$$

When $a = 2$; $c = 1$; $b = -4$ and

$$H_s = K\frac{Q^2\rho}{D^4} \qquad (167)$$

For a system of fixed size, therefore, the system resistance varies as the square of the rate of flow of a given fluid (ρ fixed) or as the density of various fluids at the same rate of flow (Q fixed). This conclusion is consistent with our study of the details of turbulent resistence.

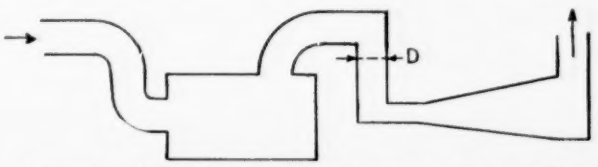

Fig. 41. Dimensional analysis of system in terms of D.

The fact that for fixed Q and ρ for similar systems of different size, the system resistance varies inversely as D^4 is also consistent with our previous study (compare equation 77, in Part 3, where L/D^5 is, for simliar systems, proportional to $1/D^4$), but this fact is of little use because we do not ordinarily deal with strictly similar systems of different size. The relation will be useful only in the testing of models, a practice that is not common in the design of systems (as distinct from fans as discussed below).

A like formulation for system power (foot pounds per unit time; force times distance divided by time) gives

$$P = KQ^aD^b\rho^c \qquad (168)$$

$$[ML^2T^{-3}] = [L^3T^{-1}]^a[L]^b[ML^{-3}]^c \qquad (169)$$

$$\left.\begin{array}{l}[M] \quad 1 = c \\ [L] \quad 2 = 3a + b - 3c \\ [T] \quad -3 = -a \\ a = 3;\ c = 1;\ b = -4\end{array}\right\} \qquad (170)$$

$$P_s = K\frac{Q^3\rho}{D^4} \qquad (171)$$

which also is consistent with our previous study. P is proportional to QH_s (Equation 150). Equation (167) multiplied by Q, would yield equation (171).

So we see again that for a given system (D fixed) the system power is proportional to the cube of the rate of flow of a given fluid (ρ fixed) or is proportional to the density of various fluids at the same rate of flow (Q fixed).

In the laminar region friction and viscous forces dominate; acceleration forces are negligible; density drops out and its place is taken by viscosity.

$$H_s = KQ^aD^b\mu^c \qquad (172)$$

$$[ML^{-1}T^{-2}] = [L^3T^{-1}]^a[L]^b[ML^{-1}T^{-1}]^c \qquad (173)$$

$$\left.\begin{array}{l}[M] \quad 1 = c \\ [L] \quad -1 = 3a + b - c \\ [T] \quad -2 = -a - c \\ c = 1;\ a = 1;\ b = -3\end{array}\right\} \qquad (174)$$

$$H_s = K\frac{Q\mu}{D^3} \qquad (175)$$

Similarly for the system power (proportional to QH_s)

$$P_s = K\frac{Q^2\mu}{D^3} \qquad (176)$$

For a given system and a given fluid (D and μ fixed), the system resistance is proportional to the rate of flow and the system power is proportional to the square of the rate of flow.

For a given system and the same rate of flow of different fluids (D and Q fixed) the system resistance and the system power are proportional to the viscosity of the fluids.

For bubbling apparatus, as we have characterized equipment in which gas is bubbled through a body of fluid, the system resistance is, to a fair approximation, independent of the rate of flow and of the fluid properties;

$$H_s = \text{constant} \qquad (177)$$

Hence the system power is proportional to the rate of flow.

$$P_s = KQH_s \qquad (178)$$

For a general system comprising any two or all three of the foregoing elements no general statement can be made. We go back to equations (132) and (152), where coefficients vary with the properties of the fluid, the first (a) proportional to fluid density, the second (b) proportional to fluid viscosity, and the third (c) independent of the gaseous fluid (dependent on the liquid through which the gas is bubbeld).

Equivalent Orifice

Any system through which a fluid flows at the rate Q may be imagined to be replaced by a frictionless well-rounded nozzle that would discharge the same fluid at the same rate with the same overall drop in total pressure. That is, P, Q, and H_s would be the same as for the actual system.

The flow through such a nozzle is given by equation (123) (Part 5) as

$$Q = A_oV_o = 1096\sqrt{\frac{H_s}{\rho}}\,A_o \qquad (179)$$

where H_s, the system resistance, replaces the pressure drop through the nozzle.

The area and diameter of this fictitious nozzle are given by

$$A_o = \frac{Q}{1096\sqrt{\dfrac{H_s}{\rho}}} = \frac{\pi}{4}D_o^2 \qquad (180)$$

If we rationalize and rearrange this equation, we have

$$H_s = K\frac{Q^2\rho}{D_o^4} \qquad (181)$$

which is identical with equation (167). The behavior of the equivalent orifice is identical with that of the system for flow in the turbulent region.

A like conclusion would follow for flow in the laminar region, for there the nozzle flow equation would be different from equation (179) and would agree with equation (175).

For a system with only turbulant resistance, the size of the equivalent orifice will clearly be a constant. If the system resistance changes (as by damper adjustment or dirt accumulation) the size of the equivalent orifice will, of course, change. For a fixed system, however, a fixed equivalent orifice will behave exactly like the real system for various rates of flow of various fluids.

For a system including turbulent, laminar, and bubbling flow, or any two of them, no general statement can be made, but for any specific case it will be easy to compute the size of the equivalent orifice if it is desired. The size will vary with Q, ρ, μ, so that no single orifice will be equivalent to the system, for different rates and fluids.

In practice, the concept of equivalent orifice is not commonly carried as far as computing its diameter. It is rather used as a qualitative description of the system resistance.

Part 7, to be published next month, will begin a discussion of fan performance, fan types, characteristic curves, and ratings.

HEATING and VENTILATING PRISONS

In the design of prisons, there must be included special provisions for heating and ventilating, since conventional methods are not suitable. Design data are presented, based on extensive experience and study of the Bureau of Prisons, Department of Justice.

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Heating and Ventilating Prisons

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Correctional institutions present special problems to the engineer concerned with the design of heating and ventilating systems for these buildings. Data of value to such designers are presented based on the extensive experience and study of the Bureau of Prisons, Department of Justice.

Mr. Rinehart, a native of Louisiana, received his B. S. in general engineering from Louisiana Polytechnic Institute in 1927. He entered the heating and ventilating field with the old York Heating & Ventilating Corp. and, with the exception of four years, he has always been associated with heating and ventilating. In 1946 he came with the Bureau of Prisons as engineer for their newly formed Advance Planning group. When this group was dissolved he transferred to the Bureau's Construction Division.

The past few decades have witnessed many changes in the approach to social problems such as public health, education, aid to aged, guidance for youth, and many others less publicized. The science of penology has shared in this movement.

Much progress has been made in forwarding the concept that correctional institutions are not merely places for punishment of offenders but are rather for the protection of the general public. They must furnish an opportunity for adjustment of a maximum number of law breakers to a normal life outside prison walls. This is a concept that many do not fully appreciate.

Architectural and engineering design must adapt themselves to the demands of new philosophies in the planning of prison facilities. However, very little helpful written material on the subject has been available and, even very recently, old and completely unsatisfactory designs have been copied. These serve as strait jackets on penological progress.

This was one of the reasons that prompted Congress in 1946 to appropriate money for formation of an Advanced Planning Unit as a part of the Federal Bureau of Prisons. A part of the duties of this unit was the preparation of the "Handbook of Correctional Institution Design and Construction" to be of assistance to architects, engineers, planning commissions, legislators and administrators in the planning of new or the remodeling of old institutions. It provides standards for the design of inmate housing and other functions of a well-planned institution, whether on the national, state or local level. The writer has drawn heavily from this book for both illustrations and subject matter.

Although the discussion following will be confined to Federal institutions, it will also apply to state institutions, county jails and other special facilities as some of the types of inmate housing discussed are used in most places of detention in, at least, modified form.

Types of Federal Institutions

Although many factors are necessary to make a good prison none is more important than classification. Old persons must be separated from youth, the habitual criminal from the new offender, the weak must be protected from the vicious, and so on.

One step in classification is variety in the types of institutions. The Federal prison system consists of penitentiaries, correctional or medium custody institutions, reformatories, and camps, in addition to various special classifications such as a women's reformatory, a hospital for the criminally insane, the Federal Detention Headquarters in New York City, the National Training School for boys in Washington, D.C. and the most widely known Alcatraz for those who present particularly troublesome custody problems. Each of these types of institutions is a separate problem in planning and in operation. However, all have common requirements and the data in this article are applicable, in some part, to all.

The first four types of institutions listed are graded roughly but not inflexibly for age and seriousness of crime. Minimum custody inmates, (those requiring a minimum of supervision) are required in a penitentiary (maximum custody institution) for operation of the farm, sewage treatment system or other activities outside the walls of the institution; medium custody personnel are useful in laundry, kitchen, power house and other necessary functions of a prison. Further classification is required within each institution.

Types of Inmate Housing

Various types of housing are in use in Federal institutions. Inside cells are most secure and are followed by outside cells, dormitories and honor rooms. Other cells, more special in nature, are also required. All will be described as well as the heating and ventilating of each. Figure 1 is a plot plan of one of the newest institutions —the United States Penitentiary at Terre Haute, Ind. This penitentiary contains all the types of housing mentioned and its plan of construction has made simpler the attainment of the objectives of the Federal Prison System.

In this illustration, the following abbreviations apply: *A*, administration; *B*, dormitory; *C*, honor rooms; *D*, *E*, and *F*, cell blocks, outside; *G*, confinement; *H*, dining, auditorium; H_1, kitchen; *I*, maximum security; *J*, *K*, and *L*, cell blocks, outside; *M*, quarantine; *N*, hospital; *O*, maintenance shops; *P*, storage; *Q*, laundry; *R*, power plant; *S*, garage; *T*, industries; *U*, guard towers.

Special Design Problems

The designer of heating and ventilating systems for a prison has exactly the same problems that confront a heating and ventilating engineer and he also has some that are unique to the application. Some might also deserve consideration in the planning of other types of buildings.

Security

Security is a vital consideration and one peculiar to prisons and other institutions charged with the detention of people. Each time a wall is breached by a duct opening or louver, a potential escape hazard is created. Therefore, the heating and ventilating engineer must keep such openings to a minimum both in number and in size. Where openings must be made in outside walls or roofs of buildings, they must be reinforced with iron bars set securely in the masonry. We recommend ¾-inch bars set 4 inches on center vertically and 12 inches horizontally.

Tampering

Tampering with controls and dampers is not peculiar to inmates of prisons, for civilian personnel are also often guilty of this practice. For this reason we suspect that the subject deserves attention in most installations.

The possibility of tampering is a compelling influence in our selection of controls. Other factors to be considered are location and type of dampers, and design of grilles. One must always remember that, even in the best operated prisons, some prisoners have too much idle time and even the most stubborn screw will finally yield to patience and the simplest of tools. Therefore, exposed screws in cells should be of the deformed head type, although even these may finally be loosened. It is preferable to locate nuts or heads of screws outside the cell.

While it is usually possible to locate dampers beyond the reach of unauthorized personnel, both supply and exhaust dampers for certain types of cells are, of necessity,

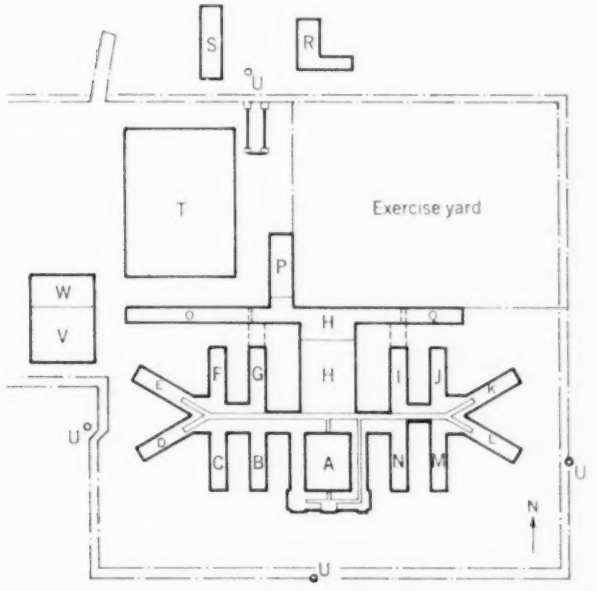


Fig. 1. Plan of the U. S. Penitentiary at Terre Haute, Ind., one of the newest institutions.

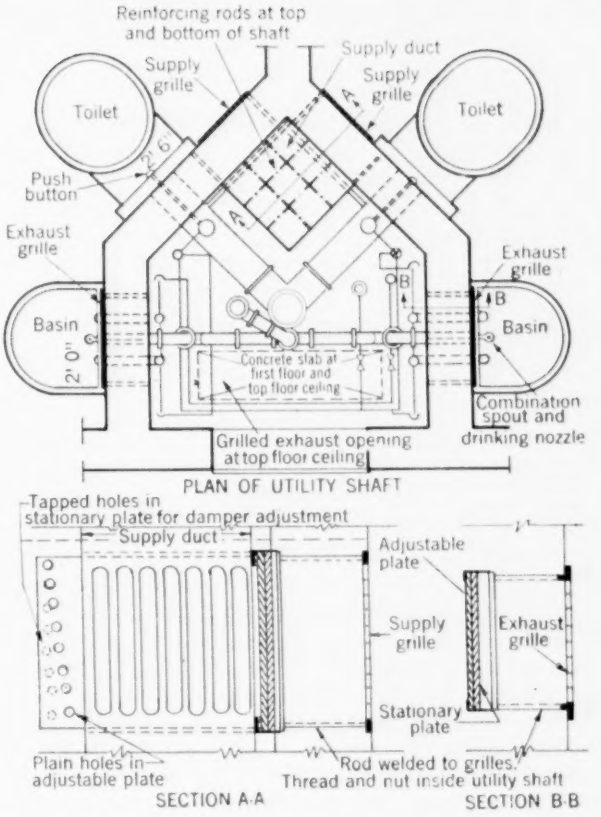


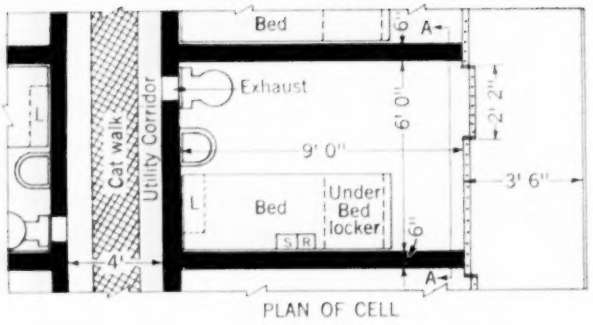
Fig. 2. Plan of a utility shaft and a detail of the air supply grille.

located within the reach of the inmate except for the protection of the accompanying grille. A combination of grille mounting and damper design which should be satisfactory is shown by Figure 2. Slotted dampers are provided at the face of the partition for the pipe shaft serving the cell. The dampers are composed of one sliding and one stationary slotted steel plates. Staggered bolt holes are provided at one end for adjustment. Grilles may be punched steel plates for exhaust and a commercial, directionally adjustable type for the supply. They are set in the cell side of the partition but have no screw heads or nuts inside the cell. Instead, a rod is welded to the pipe space side of the grille. The other end of the rod is threaded and screwed to the damper frame by a nut.

Communication Between Cells

It is desirable in certain types of cells to eliminate communication from cell to cell. With this in mind, ducts connecting to individual cells are often made from prefabricated asbestos rather than sheet metal and they are arranged with extra elbows and individual connections to the main ducts. Further discussion of this point will be presented in the data on the various types of cells.

The water closet can become a communication device. With a paper cup or other utensil, the inmate can remove the water from a water closet trap and pour it in his lavatory. If some other inmate does the same, he has a speaking tube through which he can talk and be understood if he properly pitches his voice. This can be overcome by placing an additional trap in the waste line outside the cell. Waste lines and other pipes also can be made to serve



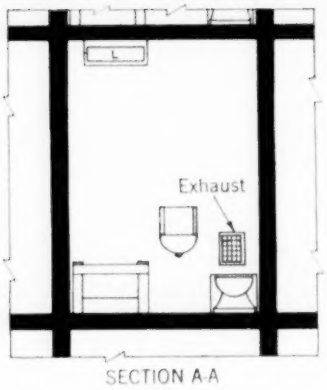


Fig. 3. Details of a standard inside cell

as transmitters of code messages by tapping on exposed metal parts. For this the Bureau has found no satisfactory solution except constant watchfulness on the part of correctional personnel.

Contraband

The heating and ventilating engineer must also be careful to provide no place for the stowing away of contraband articles. These may be stray bits of metal, illicit notes, threaded pipe nipples stolen from a shop and intended for use as a spreader for prison bars or one or more of many other items hidden for possible use in riots and attempted escapes, or breaches of discipline.

This is another reason, not only for special treatment in the mounting of grilles, but also for placing thermostats, thermometers and other equipment beyond the reach of the inmate.

Personnel

The designer of heating and ventilating systems for prisons must also give serious consideration to the ever present shortage of trained operating personnel. While this is apt to be true of other types of institutions, it is especially true for the prison system which at any level is usually particularly short of operating funds. Equipment must be purchased and located so as to require the minimum of maintenance.

As far as possible, all equipment requiring care should be centrally located. It is the Bureau of Prisons' policy to place not only boilers, turbo-generators and related equipment in the boiler house, but also air compressors, water heaters, refrigeration equipment, domestic water and fire pumps and any other mechanical equipment suitable for such placement.

Obviously, since it is impractical to place heating and ventilating fans for institutional buildings in the boiler house, fan rooms should be provided for the various buildings with separate entrances for use only of maintenance personnel. All necessary thermostats, main dampers or other mechanical or electrical equipment that can logically be placed there should be located in these rooms.

Under this heading should also be mentioned the requirement of adequate space for equipment and maintenance. In the never ending battle for space, the engineer sometimes allows his equipment to be placed in poorly located and crowded quarters. This is annoying, for piping and ductwork must eventually be replaced, dampers adjusted, equipment maintained, and at times torn down. Architects of the Bureau of Prisons understand these requirements but other engineers are not usually so fortunate. They should not, of course, be excessive in their demands, but it is certainly their duty to insist that fan rooms and pipe spaces be of adequate size for easy removal of equipment and replacement of parts. Such spaces should be carefully detailed, keeping in mind the problems of the operating and maintenance personnel. The accompanying illustrations show dimensions that will be helpful in the selection of space requirements.

Heating Media

The Federal Bureau of Prisons favors steam as a heating medium for it can be circulated without auxiliary equipment other than a vacuum pump which can be located in the power house. Steam can be used for tempering outside air without danger of freezing and bursting coils. Steam also requires fewer steps in the heat exchange process than does hot water and should give a higher over-all efficiency. Certainly there will be fewer cleaning and scale removing problems for coils.

Although we recognize that hot water heating has advantages in many applications, auxiliary equipment is required, often at a remote point, with resultant increase of maintenance.

Steam pressure reducing valves are usually placed in the power house and low pressure steam conveyed to the various buildings to reduce the number of pressure reducing stations and their attendant maintenance.

Tunnel Systems

Because of the central location in the boiler house of all possible mechanical equipment and the consequent large size and number of pipes to the other buildings of the institution, it is the policy of the Bureau to install all main connecting piping, other than cold water and sewers, in tunnels. These should be of ample size for painting and replacing of pipe and insulation, for inspection of pipes and expansion joints, and for passage of personnel.

Small concrete lateral trenches may be used to connect isolated buildings to the tunnel as the larger access tunnels to these locations usually cannot be justified economically.

Incidentally, where at all feasible, the Bureau favors expansion bends rather than joints. Once again we have the problem of maintenance or failure and we find the bend to be superior in both respects. In tunnels or other locations where bends are neither practical nor economical, we prefer to use the bellows type of joint as it does

not stick or require repacking. However, in an institutional pipe line that is often valved open or closed, as is the case with the heating line in one of our institutions, the frequent flexing may cause failure of a bellows type joint and a slip type may be superior.

Types of Heating Systems

Central station warm air heating systems is the choice of the Bureau for heating most types of inmate housing. Again we are strongly influenced by the decrease in maintenance with this system.

With radiators, many traps should be opened and inspected each year. With warm air, this is no major problem and inspection and care of fans, motors and drive belts is relatively simple. A possibly more important reason for the choice of hot air for heating is that ventilation must be provided in any case and larger equipment does not greatly increase either first cost or maintenance. It must be remembered, and some of the accompanying illustrations will show, that most prison cells are also toilet rooms. Therefore, they must receive ventilation to remove toilet and body odors.

An institution for the housing of many people must be scrupulously clean to avoid a characteristic institutional odor. Cleanliness, however, should be considered as only a twin requirement to a well-planned and intelligently operated ventilating system.

The writer remembers his pleased surprise at the general cleanliness and lack of any offensive odor at the first Federal prison which he visited. Since that time he has found only one prison with "institutional odor." The housekeeping here is as good as in other institutions but the building was not originally designed for its present use and the ventilating system "just grew." Replacement of the ventilating system at this time would be expensive in both time and money but intelligent planning at the beginning would have provided a better system with no greater cost.

Another reason for the choice of warm air heat over direct radiation is the saving in floor space. The heating engineer is accustomed to a constant battle for floor space for radiation, but cells must be kept small for economic reasons, and he must realize that the architect has a real problem to solve.

Radiant heat by means of hot water coils in the floor has been used on a large scale by some states. Most of the arguments against it have been mentioned before. Ventilation is required in any case, steam must be converted to hot water, and additional pumps and converters must be provided and maintained. We believe its use might be an advantage in some structures, such as perhaps a chapel with difficulty of finding space for location of ducts or piping, but for inmate housing we think warm air is the most satisfactory and economical method of heating.

Controls

The selection of a control system is another important consideration for the design engineer. Here is an opportunity for making an important saving in operation and the Bureau has done much experimenting on the problem. The control must be (1) sensitive and quickly responsive to changes in atmospheric conditions and (2) must be protected from tampering by inmates or other unauthorized personnel. The Bureau has found the outside thermostat to be the best answer to those varied requirements for buildings heated with radiators or unit heaters.

Radiators are fitted with properly sized and erosion resistant orifices, and unit heaters are provided with pressurestats to prevent operation with no steam pressure.

Buildings are divided into single or multiple zones with a thermostat and control valve for each zone. Boards with indicating lights and all necessary relays, transformers, switches, etc. are provided in the boiler house. Also mounted on the board is a switch to open the power circuit, a switch to permit manual operation, a switch to vary the heat input to each zone and a switch for night operation. The location of these boards in the boiler house is in an effort, previously emphasized, to keep control of all utilities centrally located.

Unit heaters providing make-up air for laundries or kitchens may be too large for the off and on operation of pressurestats. For these locations steam at a higher pressure is always available and we recommend the use of a modulating thermostat in the outlet air stream controlling a modulating steam valve. The thermostat is set slightly above room temperature to provide tempered ventilation air and the room is heated by other means if heat is required.

Warm air heating systems may also be controlled by outside thermostats with the addition of a return stat as a limit control. A single thermostat mounted in the return air stream is also a workable method of control for this type of system although it lacks the sensitivity of the outside thermostat. The return stat must be placed in the fan room so as to be accessible only to the operating staff.

We recommend that control systems be of the electrically operated type to avoid installation of extra air compressors and thus to decrease maintenance.

The Bureau has as yet had no experience with the new electronically operated controls. Manufacturers claim greater sensitivity and less maintenance for this type of operation but state that first cost is somewhat higher. The use of electronically operated controls should be investigated before any final choice is made.

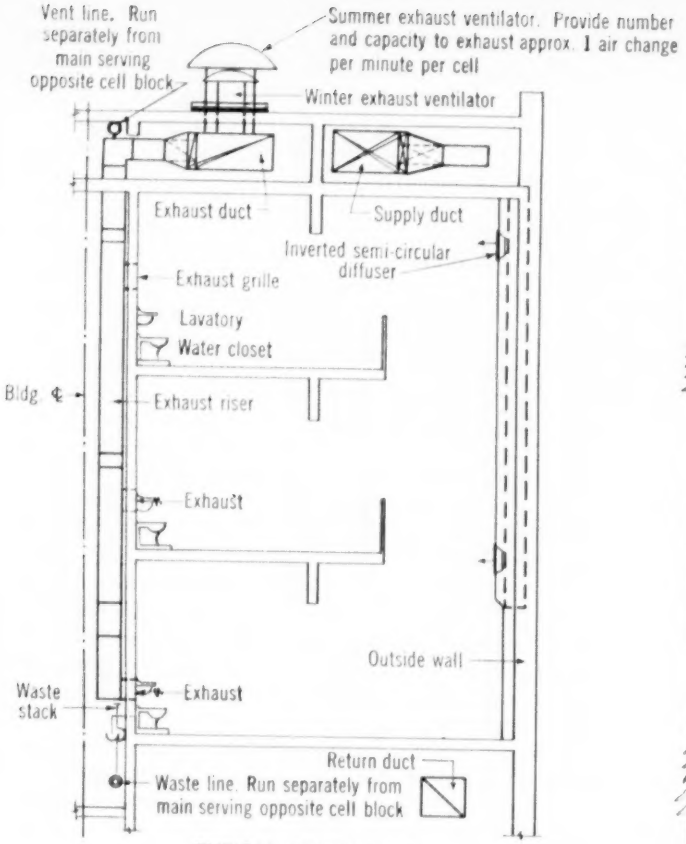
Whatever type of control system is selected, it should be as simple as is consistent with economical operation for the maintenance staff may not have sufficient training to properly supervise the more complicated systems. Certainly no system at all is better than an inoperative one.

Summer Ventilation

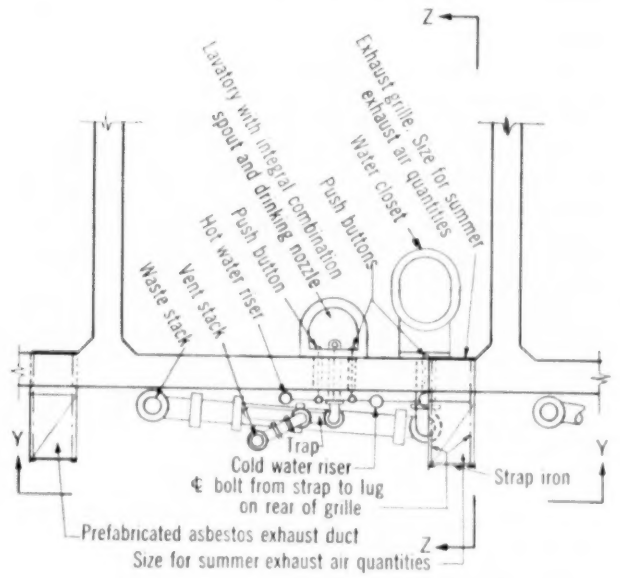
The Bureau does not consider the general use of air conditioning desirable in its present institutions but some provisions must be made for the comfort of the inmates in summer. The circulation of large quantities of outside air is recommended as the cheapest and most practicable

Abbreviations Used in Illustrations

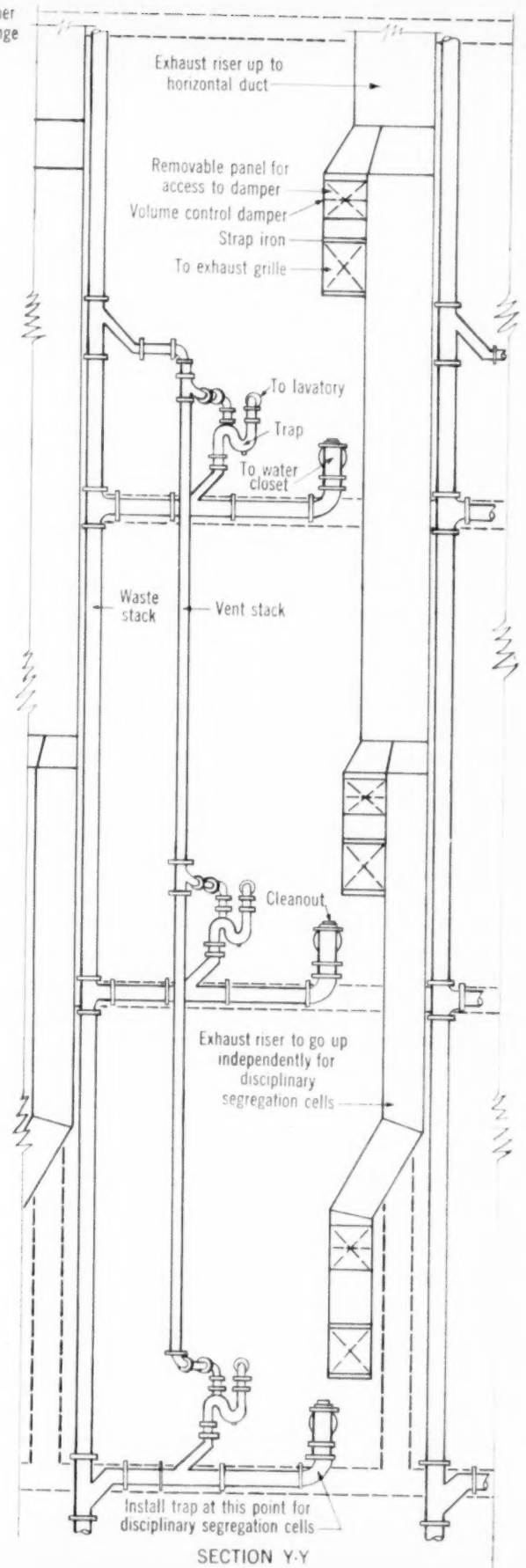
C	Nurses' call system	L	Light
CC	Control cabinet	R	Radio outlet
JC	Janitor's closet	S	Switch



TYPICAL SECTION Z-Z



ARRANGEMENT OF PIPING AND DUCTS



SECTION Y-Y

Fig. 4. Ventilating and plumbing details for typical inside cells. Services for administrative segregation cells are similar.

solution of this problem. Accordingly, exhaust ducts and grilles are usually oversized to provide for summer requirements and separate summer exhaust fans are provided. Design quantities will vary with geographical location and the individual engineer is best fitted to make decisions as to requirements. For institutions located in the higher temperature regions of this country, we recommend one air change per minute per cell.

The principal types of inmate housing within a prison have already been mentioned. These, along with their heating and ventilating systems will now be described in more detail.

Inside Cells

Inside cells are used for the detention of prisoners who are less trustworthy and offer greater security risks than the average inmate. As its name implies, this type of housing is built inside the cell block and has no outside windows. It is usually two or three tiers high and consists of two tiers back-to-back with a pipe corridor between. Open spaces are provided between the fronts of the cells and the outside walls. The outside walls are pierced by grilled windows for light and, at times, for ventilation but the inmate has no control over the windows. The individual cell is fitted with a grilled door.

Inside cell blocks have been built five tiers high and the Federal Prison system has such institutions. However, for many reasons, present practice of construction is the lower, and easier to heat cell block, two or three tiers high. Figure 3 shows a typical inside cell.

The heating and ventilating of inside cells is, in our experience best accomplished as shown by Figure 4. Heated supply air is brought from the fan room through a duct installed as shown and is discharged to the open space in front of the cells through downcomers and outlets of the diffusing type. Stratification becomes a real problem with the high ceilings necessary to this type of construction but we think the method shown is a very satisfactory solution. It has the further advantage of placing dampers beyond the reach of inmates or other unauthorized persons.

As stated earlier, and as shown by Figure 3, these cells are both living quarters and toilet rooms. We recommend that 30 cfm of outside air per cell be brought in through the supply system. The total quantity of air handled by the supply system should provide a high rate of air change and a low final temperature in order to achieve even temperature distribution both vertically and horizontally.

Return air to the supply fan is allowed to find its way through the grilled door of the cell and thence to return grilles.

Air must also be exhausted from these rooms. We recommend that 25 cfm per cell be drawn out and exhausted to the atmosphere through a separate exhaut fan. A tamper-proof exhaust grille is installed just above the water closet and is connected by a vertical duct to the exhaust main located above the cells. Exhaust grilles and ducts must be sized for summer requirements. Dampers must be beyond reach of inmates to avoid tampering.

Risers should be of prefabricated asbestos or other material that will minimize communication between cells.

As illustrated, a utility corridor is provided at the rear of the cells for installation of exhaust risers, electric conduits, and water and waste piping. It is important that

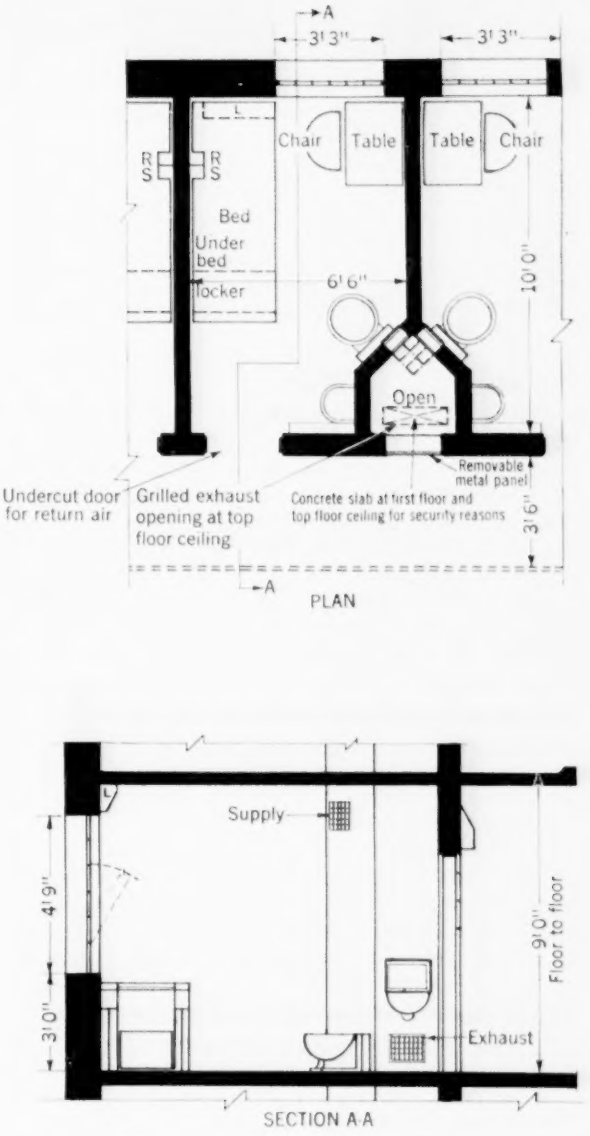


Fig. 5. Details of a standard outside cell.

adequate space be allowed for passage of maintenance personnel and for eventual replacement of pipe and duct work. The dimension of 4 ft. shown in Figure 3 is considered adequate for the width of the corridor and not excessive in its effect on the total volume of the building.

As previously mentioned, provisions should be made for summer ventilation of these spaces. Figure 4 shows a method of accomplishing this by means of exhaust ductwork and separate summer exhaust fans.

Outside Cells

Outside cells are for prisoners who are not extreme escape hazards but who do require considerable vigilance for their safe-keeping.

Figure 5 shows a typical outside cell. Cells are along the outside walls with an open space between cell fronts. Tiers should be two or three cells high with monitor lighting for the open space. The inmate has control over his window and, except for a glazed door panel, complete privacy when in his room.

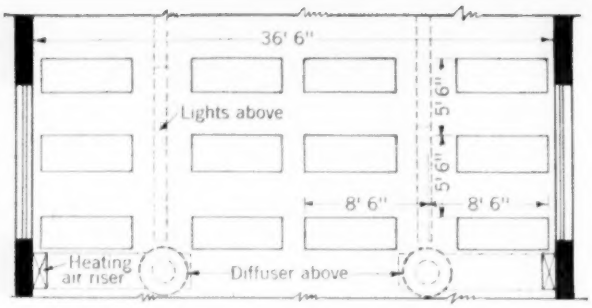


Fig. 6. Plan of an open dormitory.

The outside cell is a toilet room just as is the inside cell and the same outside and exhaust air quantities are required, that is, 30 cfm of outside air and 25 cfm of exhaust. Cast iron radiation has often been used in these rooms in the past but they infringe on already limited space, and ventilation is required in any case.

Each bank of two side-by-side outside cells is served by a common utility shaft in which all ductwork and piping must be installed. Toilet fixtures are located adjacent to the shaft. Recommended shaft dimensions are shown by Fig. 2. It is our usual practice to install a supply duct or ducts above the cells and to feed through downcomers installed in the utility shafts. Ducts are then connected to supply grilles at the ceilings of the individual cells. Dampers and supply grilles have been previously described and are shown by Fig. 2.

The utility shaft is also used as an exhaust duct with grilles set near the floor of the individual cells as illustrated. Openings in the tops of the shafts for exhaust connections must be made secure with iron bars.

Exhaust grilles and duct work must be sized for summer ventilation in most climates and tamper-proof dampers must be carefully set to avoid upsetting air distribution.

Separate summer and winter exhaust fans will usually be necessary as the discrepancy in requirements is too great for two-speed fans to cover in most climates. This is also true for other types of housing.

Return air from outside cells is allowed to find its way through a grille in the solid door of the cell or the door is undercut two inches. The latter method is cheaper and does not offer a cleaning problem as grilles do. It also is not subject to abuse.

As with inside cells total supply air, quantities should be high and final temperatures low.

Outside cells are sometimes built with the tiers completely separated by floors at the various levels. In this case the supply duct may run at the ceiling of each floor and discharge to the individual cells through the corridor partitions. This has the advantage of releasing space in the already crowded utility shaft and making simpler the maintenance and installation of duct work and piping. However care must be used in the installation of dampers to make them tamper-proof. With this arrangement, return grilles should be provided on all floors.

Dormitories

The least expensive and most flexible method of housing prisoners is in dormitories. Spacing of beds can be changed where necessary to accomodate more than the design population and, unfortunately, beds can be double bunked. Inmates, of course, must be carefully selected and supervised but many prisoners find dormitories preferable to inside or outside cells and respond favorably to their environment.

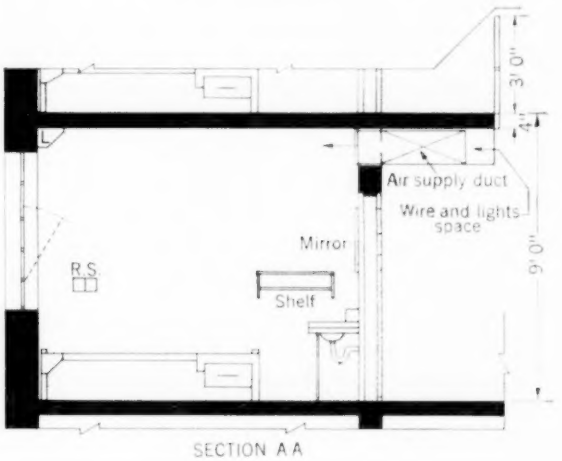
The Bureau of Prisons uses three types of dormitories, (1) the open dormitory which is completely undivided by partitions; (2) the squad room which is subdivided into smaller compartments; (3) the cubicle type which is divided into individual compartments by means of low partitions. The last type offers a measure of privacy and has other advantages such as a location for radio jacks and convenience outlets. It is, however, more expensive and less flexible than the first two mentioned.

Since the heating and ventilating problems are the same for all three types of dormitories, only the open type is illustrated, and Fig. 6 shows a typical arrangement of this type of housing.

The problem of heating and ventilating a dormitory differs from that presented by inside or outside cell blocks. The rooms are not toilets but, due to their flexibility, they are apt to become crowded. Although not desirable from any standpoint, this is a condition that must be foreseen and for which provision must be made at the time plans and specifications are prepared.

Radiators occupy needed floor space and, if individually controlled, might be sources of disagreement and possible unrest. They also produce uneven heating and "hot spots."

Unit heaters have often been used for this application. They are fairly cheap to install but require maintenance, are apt to be noisy and if not properly selected and main-



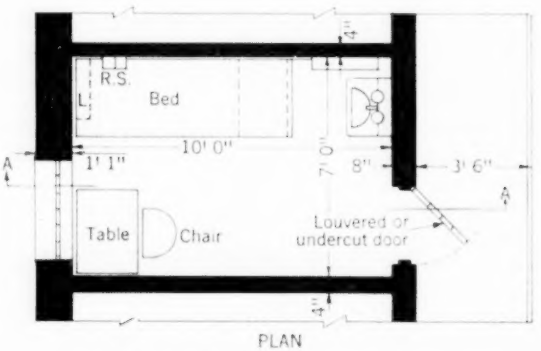


Fig. 7. Details of a standard honor room.

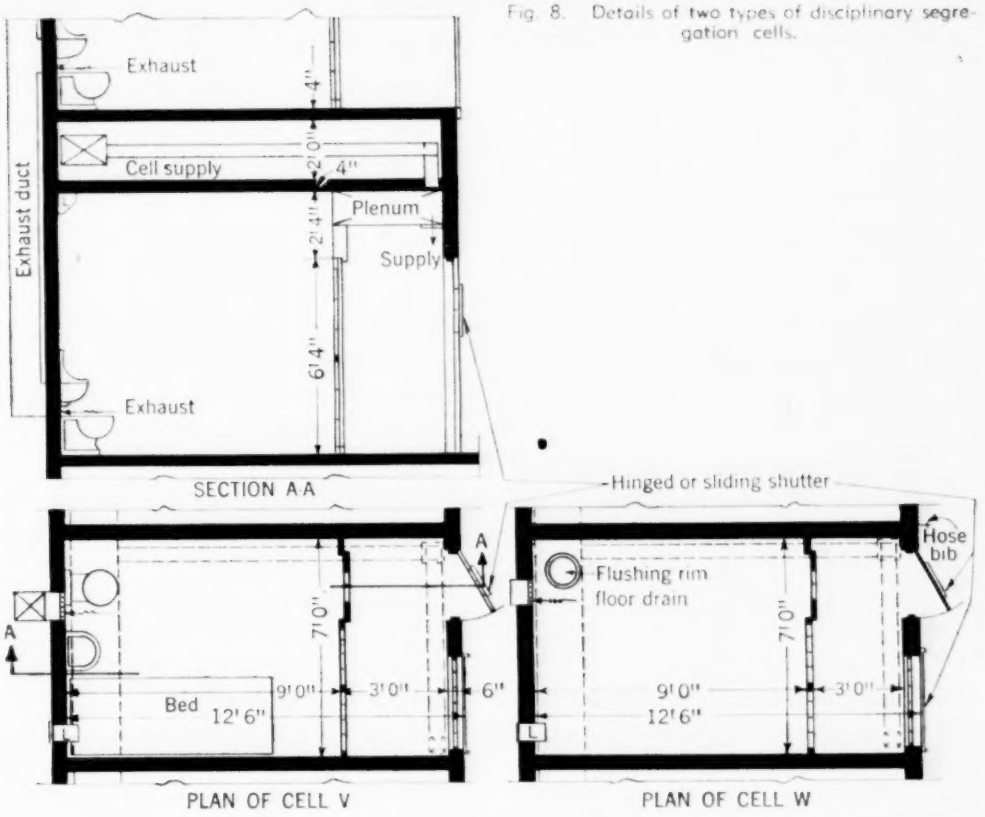


Fig. 8. Details of two types of disciplinary segregation cells.

tained, and become impractical with double bunking because of drafts on occupants of the upper beds.

Neither of these systems supply outside air and, under crowded conditions, this becomes a must. We recommend 30 cfm per design inmate. This may seem higher than necessary but the designer must remember that the space may be called upon to house two or more times the number of prisoners he used in his calculations.

Therefore, we supply air from a central system through ductwork and diffusing outlets. Total supply air should be high. The exhaust air may be handled by conventional methods.

Summer exhaust may sometimes be handled quite simply and cheaply by the use of wall fans protected from inmate tampering. Satisfactory operation will depend on correct adjustment of windows by the officer in charge of the dormitory and a marking should be provided on the window to limit the distance it may be raised.

Honor Rooms

The honor room is used as a reward for the trustworthy prisoner and as an aid in preparing him for release. Here he enjoys some freedom of movement within the housing unit, operates his own windows, and has other privileges.

The room resembles an outside cell except for its lack of a water closet and a utility shaft. Figure 7 shows a typical honor room.

While direct radiation is suitable for heating these rooms, there are certain disadvantages which have been mentioned—occupation of needed floor space, and traps and valves to be serviced. Therefore, we recommend central warm air heating with 10 to 15 cfm of outside air per room. Return air may, as in outside cells, find its way under or through the door to the central corridor and thence to main return grilles.

Since the exhaust air quantity is low, it is allowed to find its way to the outside through openings around windows or other outlets.

Supply air ducts may be run under catwalks or ceilings and discharge to the individual rooms directly through grilles high in the corridor partition. Dampers must be protected against tampering.

In all types of housing, quietness is a consideration which should not be ignored and velocities in ductwork should not be high.

As with dormitories, summer ventilation of honor rooms may often be accomplished simply and cheaply by means of wall fans and proper manipulation of windows. Some form of control for height of window openings must be set up and the simplest is a mark for the highest allowable opening. This is far from a perfect method due to abuse by individuals but we have, as yet, devised no better one.

Disciplinary Cells

In every prison there will be found some individuals who will not comply with necessary institutional discipline or must, for other reasons, be segregated.

In maximum security institutions, housing for these inmates is usually a modified inside cell type. These are of two constructions as shown by Fig. 8. Cell V contains bed, water closet and lavatory. Cell W is for those prisoners who might injure themselves or equipment and, therefore, it has no furnishings other than a mat for a bed and no fixtures other than a flushing rim floor drain.

In both types of disciplinary cells two sets of doors are furnished to enclose a vestibule. The inner door is con-

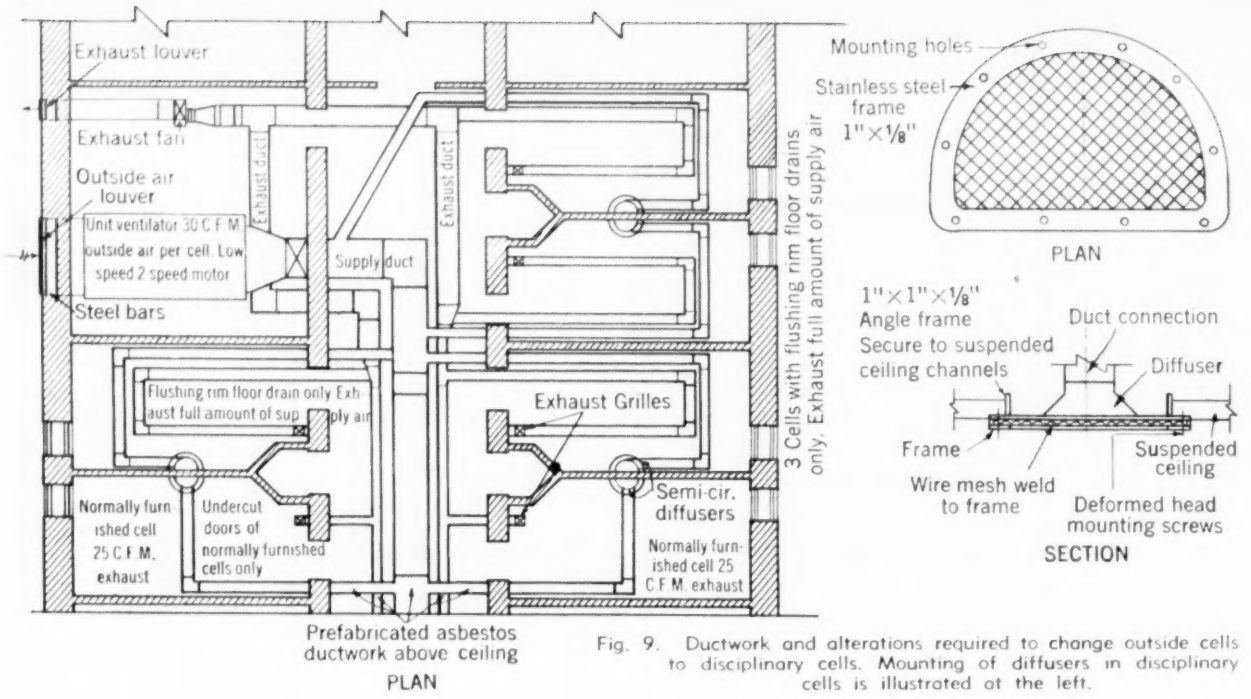


Fig. 9. Ductwork and alterations required to change outside cells to disciplinary cells. Mounting of diffusers in disciplinary cells is illustrated at the left.

structed of steel bars while the outed door is solid with a hinged or sliding shutter for observation purposes. If the inmate becomes unruly or noisy the outside door is closed to prevent disturbance and unrest among other inmates.

This group of cells is customarily placed on the first floor for ease in handling the prisoners and usually is cut off from the upper tiers of cells in the block by a ceiling over the open space in front of the cells.

Heating and Ventilating Disciplinary Cells

The heating and ventilating of these cells is an important problem. Obviously, a separate, central hot air system is required since, when the outer door is closed, no other ventilation is available. However, special considerations are involved. Communication between cells and objectionable noises must be minimized and we have not yet devised a really adequate summer ventilating system.

The illustration shows our handling of this problem for constructions in which ceilings are and are not provided. For each condition a supply duct handling 30 cfm of tempered outside air per cell for winter operation is provided. This duct is run in a furred space either over the cell or under the ceiling in front of the cell. In order to minimize noise or communication between cells, branch ducts are constructed of prefabricated asbestos and provided with several elbows. They discharge to a plenum above the vestibule and thence through a grille to the vestibule. This has the advantages of avoiding drafts in the cell proper and of being out of reach of tampering.

Since, when the outer door is closed, no air can find its way into the cell except through the supply duct, the supply fan is driven by a two-speed motor. The higher speed is used for summer ventilation and ductwork so sized.

The exhaust from disciplinary cells may be tied into the cell block exhaust system. However, the prefabricated asbestos riser must run up independently to the main exhaust duct as noted on Fig. 4. Another note on this drawing calls attention to the separate outside trap provided in the waste line serving the individual water closets. Arrangement of exhaust grilles is as for typical inside cells.

In medium or minimum security institutions, disciplinary housing may be of the outside cell type.

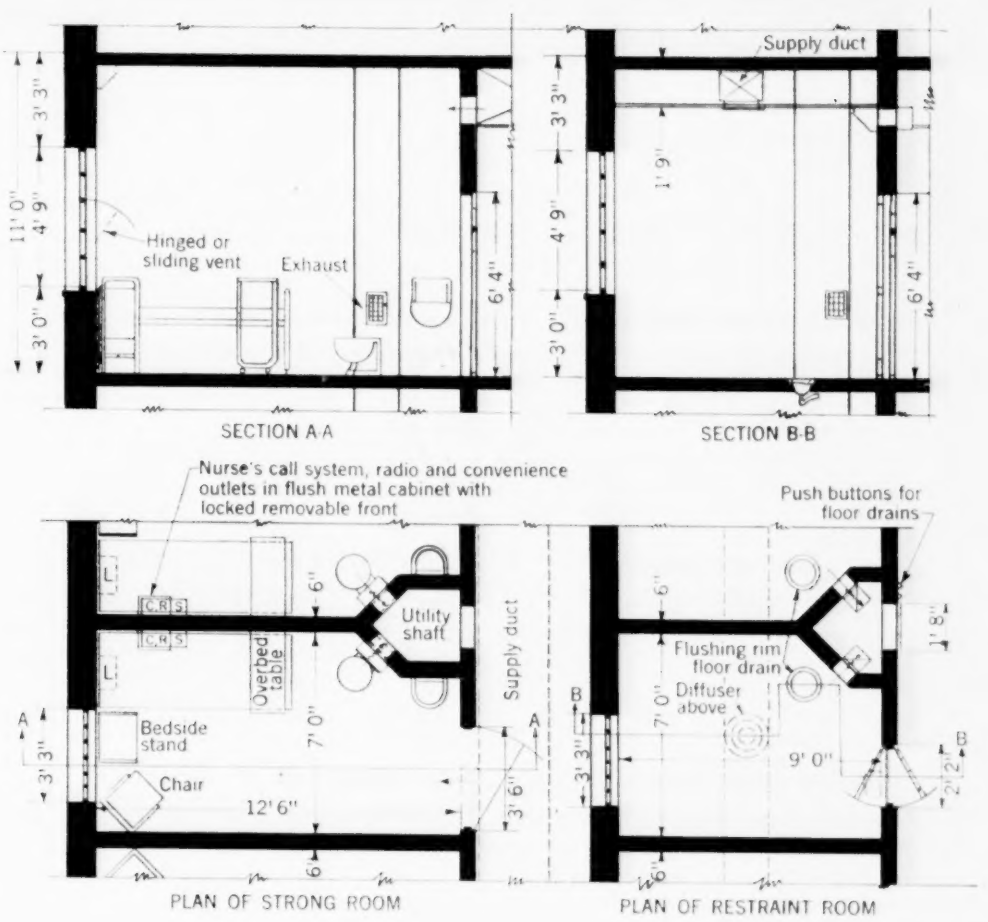
Engineers and architects in the Bureau are often confronted with the problem of converting an existing type of housing to a different use. At one institution, a proposal was made to change 16 existing outside cells to the outside type of disciplinary cell. The space occupied by two cells was set aside for heating and ventilating equipment. Three cells were stripped of plumbing fixtures and flushing rim floor drains substituted. Fixtures in the remaining 11 cells were not disturbed. In Fig. 9 are shown the proposed alteration and ductwork.

A unit ventilator with two-speed motor was available and was selected for heating and ventilating of the space which consists of 11 normally furnished rooms and three rooms with flushing rim floor drains as their only fixtures. Ductwork, grilles and diffusing outlets were sized for summer air quantities. For this installation, it was not thought necessary to isolate completely those inmates in normally furnished rooms and only necessary elbows were installed in branch ducts. Exhaust grilles were sized to handle the minimum air quantity amounting to 25 cfm per cell.

In cells with only flushing rim floor drains, however, all the precautions outlined for inside type of disciplinary cells were observed. Ducts were provided with extra elbows to prevent noise and communication between cells and, since doors to these cells are solid, the exhaust system was designed to handle all air supplied to the room.

As a precaution against tampering, the main supply and exhaust ducts were run in the corridor above a furred ceiling. Volume control dampers in the branch ducts were placed adjacent to the main ducts and access for adjustment was provided by means of removable steel plates in the corridor ceiling.

Fig. 10. Details of strong rooms and restraint rooms in the hospital section.



Strong Rooms and Restraint Rooms

These types of special housing are found only in hospitals and are illustrated in Fig. 10.

The strong room is designed for the inmate patient who is an escape risk or cannot be allowed to mix with the remainder of the hospital population for other reasons.

It is like an outside cell in most respects and is heated and ventilated in a similar manner except that all outside air is required for avoidance of the spread of disease. Air supply and exhaust may be connected to the building systems.

The restraint room presents a greater problem for the heating and ventilation engineer. It is used for the detention of the mentally disturbed patient and contains no furnishings other than a flushing rim floor drain under the control of an officer outside the room. The cell is equipped with two doors, the outer of which is solid except for a glass observation panel.

Obviously, this is much the same problem as that described under the disciplinary cells. The Construction Handbook recommends radiant heating coils in the floor for this type of cell because it was felt that a warm floor was much more preferable for the use of a, sometimes, completly undressed patient. However, once again the writer repeats, "air must be supplied for ventilation and extra equipment is required for hot water supply and circulation." If the planning authorities agree that the extra cost and maintenance are justified, he considers the proposal both sound and desirable.

In any case, the air supplied to the room must be tempered outside air through a separate system. All air supplied must be exhausted. A two-speed motor should be used for the supply fan with the higher speed for summer ventilation.

Figure 11 shows how existing space at one of our institutions, was altered to provide for two restraint rooms. A unit heater with a two-speed motor and handling 100% outside air was installed. The thermostat for controlling the heating coil was placed in the exhaust air stream just outside one of the cells in the service space between the cells. Tamper-proof exhaust grilles were provided near each cell floor and close to the flushing rim floor drains. A gravity roof ventilator was provided for the escape of the exhaust air.

Other Types of Buildings

In addition to buildings for the housing of inmates, a prison contains a kitchen, a dining room, warehouses, industrial buildings, office buildings, chapels and a hospital. Outside the walls there is usually a farm or farms with dairy buildings, slaughter houses, hog farrowing buildings, barns and other structures.

None of these present any special problems to the heating and ventilating engineer. Offices are usually heated by means of direct radiation, warehouses and industrial buildings with unit heaters. Kitchen exhaust is through hoods over equipment and make-up air is usually supplied to the adjoining dining room. Radiant heating might be

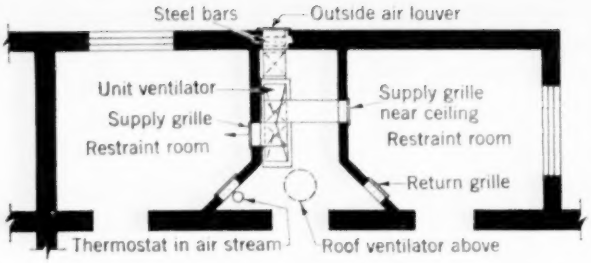


Fig. 11. Alteration of existing space to restraint rooms at a federal institution.

considered for chapels or conventional methods used. Systems for ventilation of barns and other farm buildings should be as outlined in the dependable sources. Remote buildings might be heated with self-contained, gas or oil-fired unit heaters. All systems must, however, be designed with the central thought of ease of maintenance and efficient operation.

Air Conditioning

As mentioned previously, the Bureau does not feel that air conditioning is suitable for general use in existing prison buildings.

We have installed room cooling units in a few operating rooms and offices where their use was mandatory, but we have supplied no truly conditioned air to any other spaces.

However, the Advance Planning Unit of the Bureau of Prisons prepared schematic drawings for a super-security institution with which we some day hope to replace Alcatraz. Considerable thought has been given to replacing this institution because of the great expense involved in its operation and because of its badly outmoded facilities. This step has been discussed in Congress.

Figure 12 is a cross section through a cell block of a proposed replacement. It might be of interest to know that one state has already constructed a slightly modified version of this idea and we hope that others will follow.

It will be noted that no windows are provided in this cell block but that natural light is provided through overhead glass. The building must, of necessity, be completely air conditioned and the illustration shows how we propose to arrange duct work and grilles or diffusing outlets.

All that has been said about inside cells applies to this design. Fan rooms will be located off a connecting corridor under which will run a tunnel containing steam and chilled water lines.

Water will be chilled in the power house by means of centrifugal compressors and piped to the individual central air conditioning systems.

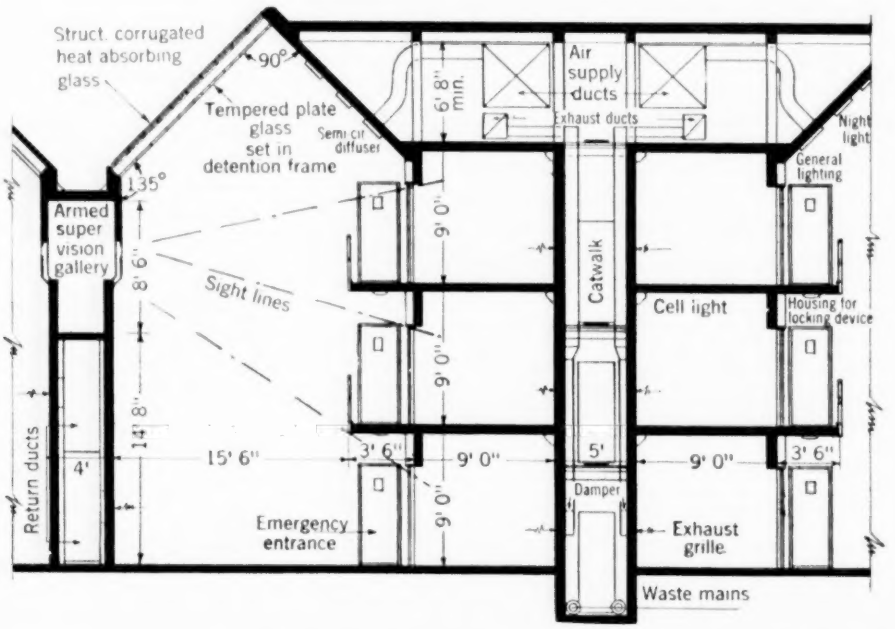
Details of the control systems have not been perfected but they will utilize outside thermostats and will be as simple as is consistent with economical operation.

Summation

In summation, the writer considers it imperative that the designing engineer for prison heating and ventilating systems should have the experience and the ability to understand the problems of the operating and maintenance engineers and of all personnel charged with the smooth operation of such an institution. He must be able to distinguish the important from the trifling and design a system that will meet the requirements of ease of operation and maintenance, security, and efficient and economical results.

It has not been easy to divorce the subject of heating and ventilating from those of lighting and plumbing in particular, nor the broader subjects of steam generation, water handling, electric power distribution, etc., in general, but it has been necessary to do so in order to stay within the framework of the subject. The designing engineer for these services faces the same problems as the heating and ventilating engineer. The selection and installation of plumbing and cell lighting fixtures must be based on the considerations discussed in this article and close cooperation between designers of the various types of systems is of the greatest importance.

Fig. 12. Details of an inside cell block in a proposed super-security institution.

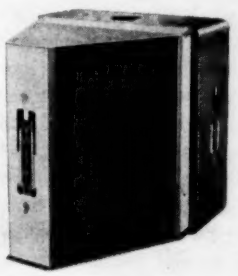


NEWS OF EQUIPMENT AND MATERIALS

Use the prepaid postcard opposite page 141 for securing additional information on items described in this department.

Air Cleaner Assembly, 6 Sizes

An air cleaner assembly for unit heaters, the Clean-Core, consisting of a die-formed filter frame with standard size cleanable type air filters, and which can be installed quickly and easily on existing or new horizontal unit heaters of its own make, is announced by Young Radiator Co., Racine, Wis. The assembly is built in six sizes for 11 models of Young Type SH unit heaters which are used in hot water or steam heating systems.



Installations of an assembly eliminates costly cleaning of unit heaters, especially if the unit is located in an area where dust, oil mist, or foreign matter is prevalent in the atmosphere. The assembly is also advantageous for unit heaters installed in industrial plants where regular cleaning of them is impractical due to the proximity of precision machines.

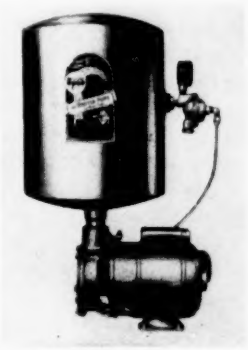
The unit is electric welded assuring a rigid and vibration-free component. It is fastened to the top and bottom of the unit heater casing, and can be installed quickly in the field when so desired. It takes only a few minutes to install the filter frame and only seconds to remove the filters for cleaning.

More Information? Circle Item 1 on postcard, page 141

Close-Coupled Pump System

Its Apco type VM Master-line water system, equipped with V-type, close-coupled, turbine-type pumps, is introduced by Aurora Pump Co., Aurora, Ill.

Available sizes range from 325 to 500 gph at 1440 rpm and 375 to 900 gph at 1750 rpm. Units are compactly designed to permit installation under sink or lavatory or in utility room or basement. The pump has a high efficiency for small capacities against moderately high pressures.

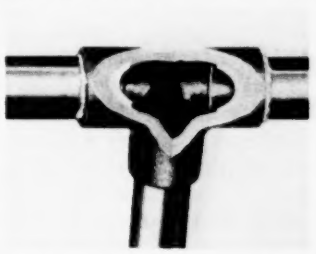


Leakage in the system is eliminated by means of mechanical seals. Systems are available with 6 gallon tanks in standard operations but for commercial or institutional use, 12, 18, 42, 82, and 120 gallon sizes may be obtained.

More Information? Circle Item 2 on postcard, page 141

Steel Tube for Heating Lines

Announcement of a line of electric welded steel tube for use in low-pressure radiator heating lines was made by Wolverine Tube Div. of Calumet & Hecla, Inc., Detroit, Mich., at the Kansas City exposition of The National Association of Master Plumbers. The illustration shows the tube soldered into a Flagg malleable iron fitting.



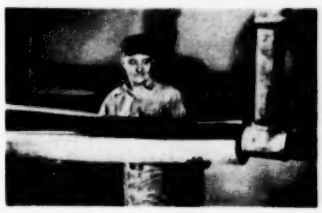
This tube is designed to be used in place of conventional pipe, not as a replacement for copper tube. Wall thickness is thinner than conventional steel pipe whose weakest point is at the root of the thread. Since the new tube is soldered, not threaded, thick walls are not necessary. Where a good sweat joint is made, the tube itself will collapse before the solder joint gives way. Tubes and fittings have been tested up to a pressure of 7500 psi. Consequently, with the new tube, no time is needed to thread tube ends and no sizing is necessary since there is a predetermined clearance between fitting and tube for solder. The same tools ordinarily used to make solder joints and copper tube systems are used to make connections between the steel tube.

The tube, available in September, will be made in sizes from ⅛ through 2 inches nominal diameter, and will be sold through plumbing and heating wholesalers.

More Information? Circle Item 3 on postcard, page 141

One Piece Glass Insulation

A new one-piece molded fine glass fiber pipe insulation, Ultrafine, is introduced by Gustin-Bacon Mfg. Co., Kansas City, Mo. The K factor is said to be considerably lower than that of any conventional pipe covering.



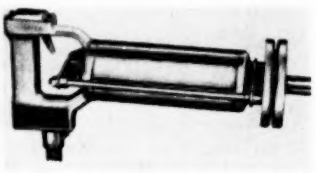
Other features include light weight; it can quickly and easily be spread at the seam to snap over pipe and quickly snaps back into its original cylindrical shape when applied over pipe, and it will not break, powder, crumble, bend out of shape, or otherwise deteriorate in transit, in storage, or on the job.

The insulation can be quickly and accurately cut with an ordinary knife, there is no irritating dust or coarse fibers, and the new material can be painted for the sake of appearance, left as is, or finished as desired. It is furnished in 6-foot lengths, said to be lighter than conventional 3-foot lengths of other insulations. Because there are fewer seams and end joints, there is less possibility of heat leakage.

More Information? Circle Item 4 on postcard, page 141

Electric Hammer Type Drill

The Model No. 17RO electromagnetic hammer drill for highspeed hole drilling in concrete, brick and stone, has been added to the line of electric hammers and hammer drills made by Syntron Co., Homer City, Pa. It has a 1⅛ inch drilling capacity, weighs 21½ pounds, and is available for operation from 110 volt A.C. or 220 volt A.C.



Automatic rotation of the carbide-tipped, spiral-fluted drill speeds up hole drilling, eliminates manual turning of the drill chuck and reduces fatigue. This automatic rotation of the drill bit is accomplished by a rubber ratchet mechanism actuated by the recoil of each blow of the piston at the rate of 3600 blows per minute.

More Information? Circle Item 5 on postcard, page 141

Steel Condensate Coolers

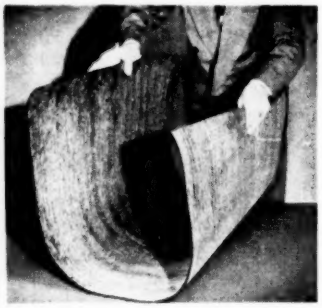
A condensate cooler, for use as an economizer, in preheating water, processing, or for heating radiation by cooling return condensate, is manufactured by Taco Heaters, Inc., Providence, R. I.

Available in diameters of 4 to 16 inches, the shells are made of steel construction. Tubes are available in 2 to 8 foot lengths and are ¾ inch copper, assembled in removable U-bend bundles. The cooler has a guaranteed working pressure of 125 psi.

More Information? Circle Item 6 on postcard, page 141

Glass Fiber Reinforced Mat

Duramat, a glass fiber mat reinforced with parallel strands of glass yarn, coated with waterproof asphaltic materials, is manufactured by Glass Fibers, Inc., Toledo, Ohio.



Uses for this product include application as a vapor barrier under basementless buildings and in refrigerated rooms; a covering and weather sealing for above ground insulated pipes and exposed ducts; and a lining for irrigation ditches, laterals, canals, farm stock ponds, reservoirs, and swimming pools.

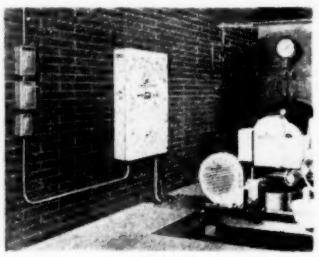
The reinforced glass fiber mat gives added strength and makes it highly tear and puncture resistant. It is very flexible, bends around curved or irregular surfaces without difficulty, and conforms readily to ground contour. It will not rot or deteriorate.

No special skill and a minimum of equipment is needed to install the mat for all applications. It can be cut with a sharp linoleum or roofing knife and sealed with a rapid-sealing asphaltic cement.

More Information? Circle Item 7 on postcard page 141

Heating Plant Control Panel

A control panel for automatic heating and power equipment is announced by Iron Fireman Mfg. Co., Cleveland, Ohio, designed to guarantee proper mounting and wiring for commercial and industrial controls, regardless of the fuel used.



Panels are supplied in standard assemblies for the most frequently used types of controls, and in custom-made assemblies for meeting special needs. Standard controls are for 230-volt, 60-cycle current.

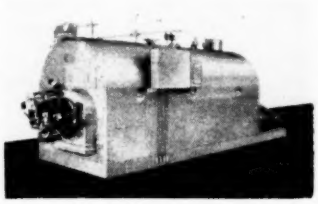
All controls, switches, instruments, and gages are mounted, wired, and tested at the factory. A terminal strip is provided for field connections of the external wires leading from the panel to the burner-mounted controls. A switch permits manual starting and stopping of the burner; a second switch allows holding the burner in low-fire position. Fuses can be replaced without opening the panel door. An indicating meter is available to show the operating condition of the electronic control system.

Over-all dimensions of the panel, which is finished in baked-on blue-green, are 36¼ x 28¼ x 5¾ inches.

More Information? Circle Item 8 on postcard, page 141

Boiler Fired Off-Center

The EconoTherm boiler in sizes through 250 hp, featuring off-center firing which is said to have advantages in performance and safety, and efficient water circulation in a rotary motion, is manufactured by Dutton Boilers Div., Hapman - Dutton Co., Kalamazoo, Mich.



Off-center furnace location provides a high column of water over the hot furnace, which is said to increase safety and protect boiler against low water damage. Steaming is fast with elimination of surging and priming. The design also helps maintain a steady water line when taking a full head of steam off the boiler.

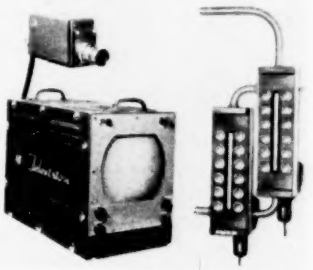
A three-pass, modified Scotch internal furnace type steam generator, which includes a modern one-piece welded boiler shell is included. All models are built with a large steam storage space and five or more square feet of water heating surface per rated horsepower to insure long life for the shell.

Removable side panels neatly covering the base and serving as additional insulation are used. Completely packaged and tested at the factory, the unit is delivered ready to make service connections. Burners are available for gas only, light oil only, heavy oil, or with gas and light oil combination for quick conversion.

More Information? Circle Item 9 on postcard, page 141

Water Gage Readings Televised

Application of industrial television to installations of Yarway pressure sealed flat glass gages, bringing live gage readings down to the operating panel or any other convenient location in the boiler plant, is now available as a result of an arrangement between Radio Corp. of America, Camden, N. J., and Yarnall-Waring Co., Philadelphia, Pa.



The television image is transmitted from a small, lightweight camera to a viewing monitor by a single cable. This simplified two-unit chain is standard equipment. The special camera base provided also furnishes proper lighting of the gages.

Gages, besides the pressure-sealed floating assembly feature, also offer for increased visibility requirements, a new separated-design advantage with interconnecting expansion loops, Welbond gage valves, circulating tie-bar and Type M illuminators.

More Information? Circle Item 10 on postcard, page 141

Armored Thermoplastic Pipe

The availability of Plastaloy-armored Ampcolite pipe is announced by Atlas Mineral Products Co., Mertztown, Pa.

This new process permits the use of thermoplastic pipe at higher temperatures and pressures than is normally considered safe. The armored pipe is available in sizes up to 6 inches OD. The armoring can be done by the manufacturer or the pipes may be armored after they have been installed.

This wedding of thermoplastic and thermosetting pipe yields a unit which is satisfactory for most corrosive solutions at temperatures up to 195F. The unarmored pipe is high in impact resistance but the impact is improved considerably by the reinforcing armor.

More Information? Circle Item 11 on postcard, page 141

Plug-in Dehumidifier Control

A plug-in type humidity control that automatically regulates portable home dehumidifiers and can be installed by anyone able to handle a screwdriver is introduced by Minneapolis - Honeywell Regulator Co., Minneapolis, Minn.

The instrument, which utilizes a human - hair sensing element, gives accurate control of the humidity content in a house and at the same time reduces cost by eliminating unnecessary operation of the dehumidifier.

It is equipped with a six-foot electric cord. To install it, the owner merely hangs the instrument on a wall, using a convenient template and two wood screws which also are provided, and plugs the cord into a wall socket.

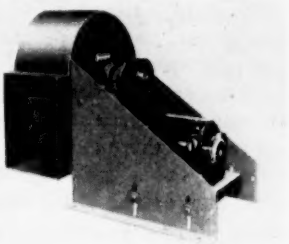
The cord has a "series" plug with both male and female outlets. After the male outlet has been plugged into the wall socket, the electrical cord from the dehumidifier is plugged ino the female outlet. The owner then sets the control for the desired humidty content and from there on the operation is completely automatic.

If the humidity in the house becomes greater than that for which the control is set, the dehumidifier will be turned on automatically and operated until the humidity content is lowered to the desired level. The control then will turn the dehumidifier off.

More Information? Circle Item 12 on postcard, page 141

Adjustable Speed V-Belt Fans

Two new belted Junior fans, No. 76 and 91, having quiet operating slow speed wheels and adjustable air delivery, are introduced by The New York Blower Co., Chicago, Ill.



Wheel design is suitable for the requirements of small ventilating problems such as exhaust from private offices, washrooms and laboratories. Wheels are cast aluminum NAFM type B spark resisting construction, although steel wheels are available.

V-belt drives have adjustable motor sheaves giving speed adjustments of 30 to 50%, depending upon motor selected. The motor platform is also adjustable for regulating belt tension after sheave adjustment.

Housing is of all-welded steel construction. Fan shaft is turned, ground, and polished, and normal duty ball bearings are used. A wide variety of capacities and air deliveries are available. Units have variable rotation and discharge.

More Information? Circle Item 13 on postcard, page 141

Compact Hot Water Relief Valve

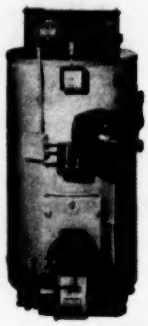
A 1¼ inch relief valve, small in size and low in cost, but with high capacity, is announced by Bell & Gossett Co., Morton Grove, Ill. The new valve, which is about half the size of its predecessor and weighs approximately one-third as much, has a rated capacity of 1,050,000 Btu per hour at 30 pounds, as compared with 1,000,000 Btu for the former model.

The new unit, equipped with a new non-ferrous high temperature seat, gives full relieving capacity under emergency pressure increase. A slight increase in pressure over the valve setting brings a corresponding low water relief.

More Information? Circle Item 14 on postcard, page 141

Oil-Fired Boiler Burner Unit

The No. 770 boiler-burner unit, a pre-assembled heating package for small forced hot water jobs is announced by Fitzgibbons Boiler Co., Inc., New York, N. Y. It has a gross output of 115,500 Btu per hour and an instantaneous Tanksaver capable of delivering domestic hot water at a rate of 3 gpm.



Wiring is in place with all connections made through a terminal block that provides for the thermostat lead and main power line. The boiler is shipped in a heavy, protective carton ready for firing after hook-up has been completed.

The drain cock and three other plugged openings make it possible to flush the boiler without removing any piping or specialties. In an actual test the unit was readied for complete cleaning and flushing in four minutes.

Standard equipment includes: steel boiler; jacket and insulation; combustion chamber; oil burner; primary control; operating control; wiring; room thermostat; Tanksaver; flow regulator; relief valve; thermometer-altitude gage circulator; thermostatic control; automatic air vent; compression tank; flow check valve; pressure reducing valve; draft regulator; flue-gas retarders; drain cock; flue brush; S.B.I. water treatment.

More Information? Circle Item 15 on postcard, page 141

Machine Makes Pebble Ice

An ice-maker, which produces pebble ice, similar to crushed ice but dry and non-mushy, is introduced by Ajax Corp. of America, Evansville, Ind.

This machine, the Pebble Ice Maker, is available in three capacities—200, 400 and 800 lb per day. It is said to be one of the smallest, most compact made, taking less than 1 sq. yd. of floor space. Its 39 inch height is ideal for under-counter-installations.

Highly simplified, the machine has three moving parts, thus insuring long-lasting, trouble-free operation. Performance features include an automatic cut-off switch which controls ice overflow no matter what type of storage container used. According to the company, the new machine wastes less than three gallons of water per day.

More Information? Circle Item 16 on postcard, page 141

Shallow, Deep Well Jet Pump

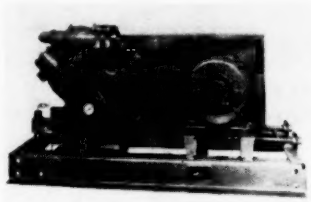
Its new Fig. 3025 jet pump, convertible for either shallow or deep well application, is announced by A. Y. McDonald Mfg. Co., Dubuque, Iowa.

A ¼ hp motor affords a full 20 to 40 psi pressure range for either deep or shallow well application. As a shallow well pump it has shut-off pressure of 54½ psi when operating with 20 foot suction lift. Construction is of cast iron and bronze, and the unit comes equipped with a capacitor motor.

More Information? Circle Item 17 on postcard, page 141

Freon Compressors

The J line of Freon compressors, now available from Worthington Corp., Harrison, N. J., combine the advantages of low and high speed operation with the long life expectancy of its lower speed predecessors.



Features of the units, in addition to the points mentioned include electric unloading whereby compressor can be started unloaded with a normal torque motor and power consumption is balanced with load requirements; improved internal manifolding whereby suction gas completely surrounds cylinder walls providing longer valve life and increased efficiency; and a new force-feed lubrication system by which the lubrication is under full pressure regardless of rotation. The only connections necessary to the compressors are electrical, eliminating complicated oil and gas pressure lines usually used for unloading cylinders.

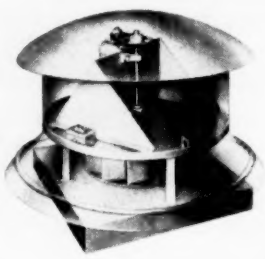
The compressors are available in sizes from 3 to 150 tons. They may be used with either Freon 12 or Freon 22 and are available also for ammonia service.

More Information? Circle Item 18 on postcard, page 141

Centrifugal Fan Roof Exhauster

The production of a new centrifugal fan type roof exhauster for air and fume exhaust against static suction is announced by General Blower Co., Morton Grove, Ill.

These units consist of a motor-driven fan in a weather proof housing and are guaranteed to provide controlled ventilation at all times. The frame is constructed of heavy welded structural steel; the motor mount and shaft support is of heavy plate; and the weatherproof housing is usually made of heavy gage galvanized iron.



Types of vertical discharge roof ventilators are designed for foundries, machine shops, and other industrial buildings where a considerable amount of oil, dust, and fumes is in suspension in the air. Various sizes and capacities are manufactured to meet particular requirements. Roof ventilators or exhausters can be used for air exhaust or intake, either with or without duct systems.

More Information? Circle Item 19 on postcard, page 141

Anchor Guards for Stud Driver

A complete line of special purpose guards for its powder actuated Model 450 stud driver is made available by Remington Arms Co., Inc., Bridgeport, Conn.

Designed for instant anchoring of special sections or fixtures to steel or concrete, the guards conform to the shape of the prefabricated sections, giving maximum coverage of the work area and fast, easy tool and fixture positioning. Each of these special guards can be rotated a full 360 degrees.

This new line of accessories includes guards for fastening conduit clips, structural angle and channel, Unistrut and Wiremold sections, Loxit channel, plywood carpet gripper, electrical switch, utility and outlet boxes, and lathing channel. Custom guards are available for fastening other types of sections. All guards are instantly interchangeable with the standard guard furnished with the stud driver.

More Information? Circle Item 20 on postcard, page 141

Improves Self-Washing Filter

A device which permits operation of the washing and re-oiling mechanism without disturbing the automatic cleaning cycle and the introduction of a unit to drain all water lines automatically as a protection against freezing, are new features incorporated in its Far-Air self-washing filter by Farr Co., Los Angeles, Calif.

The new drain unit is spring actuated, positive in action, and requires an operating pressure of 20-25 psi. Test buttons have been installed so that the cleaning and oiling mechanisms can be tested and operated at will without disturbing the automatic timing cycle.

More Information? Circle Item 21 on postcard, page 141

Side Inlet—Side Outlet Trap

The No. 814, a side inlet—side outlet steam trap with 1 or 1¼ inch threaded connections is being manufactured by the Armstrong Machine Works, Three Rivers, Mich. It meets the demand for a larger size in the popular series of traps with horizontal and opposite pipe connections.

Body and cap are cast semi-steel; valve and seat hardened chrome steel; interior trim stainless steel.

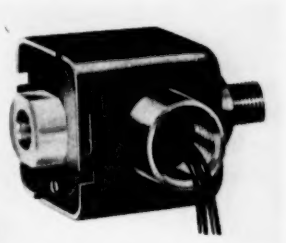
Capacities range up to 6800 lb per hr, depending on the pressure; pressure range is 0 to 250 psi. Height is 13⅝ inches, diameter 9 inches, weight 45 lb.

More Information? Circle Item 22 on postcard, page 141

Valve Delays Opening 6-8 Sec.

The addition to its line of a new type Delaytrol delayed-opening valve is announced by Industrial Sales Div., Webster Electric Co., Racine, Wis.

This new unit is complete in itself and is available as an accessory for installation in the nozzle line of any oil-burning installation. It delays the delivery of oil to the nozzle 6 to 8 seconds on cold starts, allowing motor to come to full speed. This establishes full draft and assures complete atomization and the proper amount of air for combustion.



On the shutdown, the valve provides instantaneous cut-off by extinguishing the flame while the draft fan is still operating at full speed. Sooting of flue passages, nozzle tips and electrodes can be greatly reduced; combustion rumbles, puff-back and start and stop flutter can be eliminated.

Operating normally closed in any position, its small size and straight-through design permit mounting directly on the fuel-unit or at any point along the nozzle line. Line pressure helps to maintain firm seating. Male inlet and female outlet fittings make installation easy.

More Information? Circle Item 23 on postcard, page 141

Twenty Hour Electric Timer

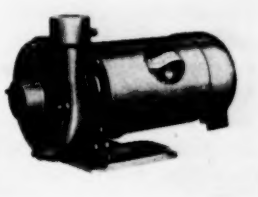
An electric timer with a 1650 watt rating, designed for use as an automatic time control attachment, is marketed by Bristol Motor Div., Vocaline Co. of America, Inc., Old Saybrook, Conn.

For use with air conditioning equipment and humidifiers, or for controlling the break-in period for motors and electronics equipment, the unit is called the Two-Timer Model 2T-20. It can be pre-set to turn on or off a properly rated device plugged into it at any time up to 20 full hours ahead.

More Information? Circle Item 24 on postcard, page 141

Leak-Proof Centrifugal Pump

A new close-coupled centrifugal pump for use in air conditioning applications has been developed by Lancaster Pump and Mfg. Co., Inc., Lancaster, Pa.



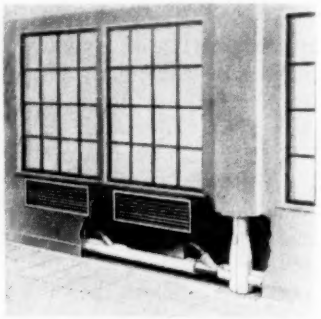
Built in sizes from ¼ to 5 hp, the pump can be installed in any position. A feature of the pump is the Guaran-Seal design which is said to assure leak-proof operation under all conditions.

Brass permanent mold impellers are prebalanced to assure the quiet operation necessary to air conditioning applications. The pumps may also be adapted to other industrial uses.

More Information? Circle Item 25 on postcard, page 141

Under-Window Diffusing Units

Intended specifically for high velocity air conditioning systems, the UTW (under the window) unit has been introduced by Anemostat Corporation of America, New York, N. Y. It requires no coils, drains, drip pans or special thermostats.



The units are equipped with special high aspiration Anemostat air diffusers. The air is controlled throughout both the cooling and heating cycles by vane type aspirating controlled-induction diffusers. Air is projected upward from the face of the unit in a rolling motion which entrains the cold or warm air from the windows or walls. The mixture is carried to the ceiling and diffused throughout the occupied space.

Controlled internal induction permits the use of high temperature differentials up to 35F on the cooling cycle. High induction of room air reduces the air density, so that the calculated velocity from the diffuser projects the air mixture to the ceiling. During the heating cycle, the induction can be reduced so that the air leaving the diffuser is of high temperature to eliminate drafts. After mixing with the cold air from the window, the mixture is carried to the ceiling and is diffused throughout the space at acceptable low velocities. The units are available in three sizes, 24, 36 and 48, the figure indicating the diffuser length.

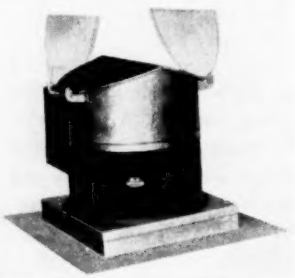
The units have a special static pressure reducing valve which, in conjunction with a scientifically designed sound attenuating chamber enables the units to handle high velocities and high static pressures and operate at sound levels as low as can be obtained with a well designed low velocity system.

More Information? Circle Item 26 on postcard, page 141

Automatic Roof Ventilator

A vertical discharge type automatic roof ventilator is added to its line by M & E Mfg. Co., Indianapolis, Ind.

Recommended for all commercial and industrial applications where positive low cost ventilation is needed to remove hazardous fumes, vapors, smoke, and dust, the units have a vertical, high velocity discharge principal of design to assure high operating efficiency.



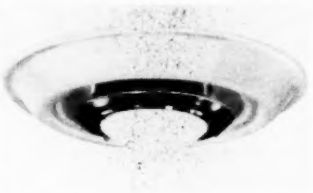
Dampers open automatically when the fan begins operation, and close tightly when operation is stopped. Exhaust air travels well above roof level preventing the possibility of re-entry into the building. Detachable motor protection cover affords adequate protection against weather hazards.

Both fan and motor are readily accessible. Units are constructed of heavy gage steel, galvanized throughout. Ventilators are furnished completely assembled, requiring only to be bolted to the fan unit. Specially designed roof ventilators and penthouses can be furnished to meet individual requirements.

More Information? Circle Item 27 on postcard, page 141

Air Diffuser and Light Fixture

The model KH-L recessed diffuser, a combined diffuser and recessed conical lens lighting fixture for use in any room in the house, is added to its line of ceiling air diffusers for residential heating and cooling by Connor Engineering Corp., Danbury, Conn.



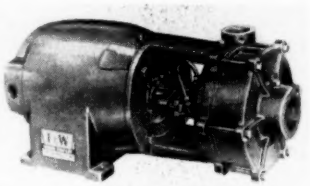
This model is furnished complete and is made in several sizes or neck diameters, accommodating 100 to 200 watt bulbs. Heating capacity ranges from 7000 to 23,000 Btu per hour and cooling from 80 to 350 cfm of air.

Bulletin KH-5, describing the operation and construction of the unit and illustrating its applications, is available.

More Information? Circle Item 28 on postcard, page 141

Line of Centrifugal Pumps

A new line of high capacity centrifugal one and two stage pumps, ranging from 1½ to 7½ hp with capacities to 120 gpm at a 15 foot suction head and 20 psi pressure, is announced by Flint & Walling Mfg. Co., Inc., Kendallville, Ind.



Designed for air conditioning and industrial purposes, the pumps can handle most types of liquids. Corrosion-resistant parts are designed for easy accessibility and maintenance.

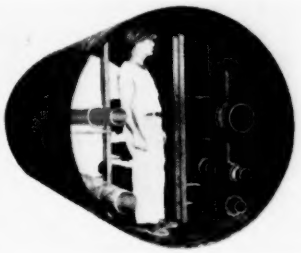
The pump and motor are integrally coupled and anchored on the motor footing. The stuffing box is integral in the motor bracket castings which form the volute back plate. Motors are standard horizontal face-mount pump type. Shafts are precision ground and polished alloy steel. Protecting shaft sleeves are stainless steel. Enclosed type impellers of high strength brass are used.

Replaceable bronze wearing rings in the pump case form a seal between the high-pressure discharge chamber and the low-pressure suction chamber. These pumps are available with rotary seal instead of stuffing box for installation where drip-free operation is required. Gland packing is easily replaced. A slinger washer, fitted to the shaft, protects bearings from the liquid being pumped. The tapped drain pocket may be piped to carry off packing leakage.

More Information? Circle Item 29 on postcard, page 141

Prefabricated Tunnel Piping

A large diameter conduit system for protection of underground distribution piping and other utility services is added to its line of prefabricated insulated piping by The Ric-wil Co., Cleveland, Ohio.



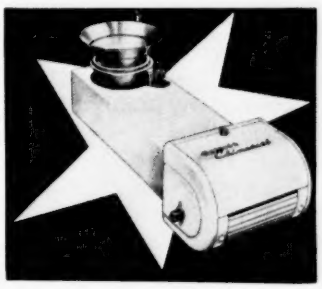
Designed to meet all the service tunnel requirements of industrial plants, colleges, hospitals, and municipalities, the system is known as the Utilidor. It is completely prefabricated to job requirements with distribution piping for steam, condensate, water lines, fire lines, or process purposes, all in place and insulated where required, including traps, valves, and expansion devices. Provision may also be made for electrical and communication cables or ceiling lights.

Shipped in easily-handled units approximately 21 feet long with simple joint connections, fittings such as tees and elbows are prefabricated to fit exactly into the conduit runs. The heavy-gage housing is constructed of corrugated ingot iron conduit, hot-dip galvanized and thoroughly protected with asphaltic or phenolic resin coatings. Conduit diameters range from 36 to 84 inches, depending on the nature and number of services to be housed. Ample walk-through space may be provided in large-diameter systems, which makes possible periodic inspection, maintenance, or alteration of the interior services, as well as allowing room for pedestrian passageway or conveyor systems between buildings if desirable.

More Information? Circle Item 30 on postcard, page 141

Gas Conversion Burner

A new Climatrol gas conversion burner will replace its former Type 500 burner, according to an announcement by L. J. Mueller Furnace Co., Milwaukee, Wis.



There have been a number of improvements in the burner design, including a new streamlined appearance. The burner is finished in a white, baked enamel finish. Called the Type 501, it may be installed in most coal-fired furnaces or boilers. It is available in long and short models so that it can be properly positioned regardless of the size or shape of the unit to be converted. Available input capacities include 125,000, 175,000, 225,000 and 275,000 Btu per hr.

Among the features of the burner are its cast iron, continuous ring, circular deep slotted burner port, which provides instant ignition and easy adjustment of the burner flame; a cone shaped stainless steel baffle which sets inside the burner to direct the flame against the walls of the heat exchanger; and a baffle design that eliminates the possibility of soot or scale dropping into the burner port.

A built-in air tube channels the secondary air and emits it through a properly sized opening at the burner port, assuring the correct amount and distribution of secondary air. The built-in air tube also eliminates the necessity for a solid hearth or internal bricking in installing the burner.

More Information? Circle Item 31 on postcard, page 141

Attic and Industrial Fans

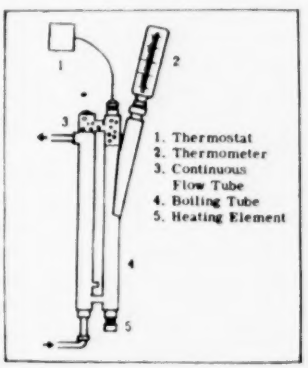
Its new Deluxe line of attic and industrial fans is introduced by The Murray Co. of Texas, Atlanta, Ga.

Both fan and motor are equipped with sealed, lifetime lubricated ball bearings, giving a model which never requires lubrication. Available in both vertical and horizontal discharge models, each unit has a corresponding standard line model in both vertical and horizontal types in all eight models from 24 to 48 inches. The sizes and specifications of the lines are identical with the exception of the sealed-ball-bearing motors which are not used in the standard line.

More Information? Circle Item 32 on postcard, page 141

Controls Moisture Content

A new instrument for accurately controlling the moisture content or relative humidity in air conditioning without the need for a moisture-sensitive element to determine humidity, is introduced by Niagara Blower Co., New York, N. Y.



As the air conditioner removes moisture from the air stream passing through it, the absorbent liquid becomes diluted, and is continuously reconcentrated to keep it effective. The amount of moisture to be permitted in the conditioned air is governed by the concentration of the absorbent liquid. This concentration has a direct relation to the boiling point of the mixture of absorbent liquid and water.

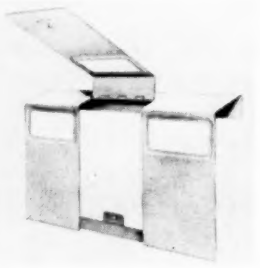
Using this principle, the new instrument consists essentially of a tube equipped with a heating element. A sample of the liquid, taken after it is reconcentrated on its return flow to the air conditioner, continuously enters this tube and is heated to the boiling point. A thermostat, with its sensing element in the tube, is set at the boiling point desired. The thermostat operates the concentrator unit to furnish a greater or less concentration of the absorbent liquid, as called for by the thermostat setting.

Since a change of several degrees in the boiling point of the absorbent liquid is required to effect a change of 1% in its concentration, the control is highly accurate and results in the holding of the relative humidity of the conditioned air to close tolerances with a simple, dependable instrument not subject to change in moisture-sensitivity.

More Information? Circle Item 33 on postcard, page 141

Baseboard Access Panels

Access panels for its Type K and Type L baseboard covers are now available from Vulcan Radiator Co., Hartford, Conn.

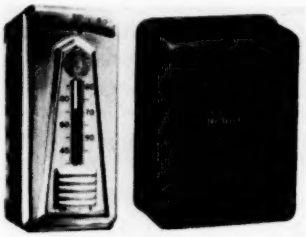


Panels are hinged to cover, easy to operate, with minimum pressure required to open and close. These access panels are furnished in a short section of cover, 13½ inches long. The access panel may be located at any point along a run of cover, a convenience for making control valves easily accessible, and the remainder of the run will take regular covers.

More Information? Circle Item 34 on postcard, page 141

Thermostat for Room Coolers

A combination of its low voltage Sensatherm thermostat and a relay, designed for window and console type air conditioners, is announced by The Mercoid Corp., Chicago, Ill. It provides close automatic room temperature control of the cooling unit and prevents unnecessary operation of the unit, resulting in long life of the conditioner and low current consumption.



The thermostat turns the conditioner on when room temperature rises above set comfort point, and off when the temperature falls below a set comfort point. The operating differential is ½F, plus or minus. No internal heaters are used. The aluminum cover is finished in alumilite that will last a lifetime.

The transformer-relay provides the 24 volt low voltage current for the thermostat. In principle it functions as a low voltage transformer and at the same time operates as a repulsion relay. It consists of two separate windings—a stationary primary winding constantly energized and a movable secondary winding or coil in which the current is induced by the primary when the thermostat circuit is closed. The closing of the thermostat circuit causes a repulsion action between the two coils, holding the secondary coil in an upward position. Since the mercury switch is fastened to the movable secondary coil, the mercury switch closes its circuit to energize the air conditioner when repulsion takes place and opens the circuit to air conditioner when the repulsion is released.

The thermostat may be installed in any part of room due to the use of low voltage wiring. The relay can be mounted adjacent to air conditioner or at any point desired.

Sealed mercury contact switches are used. They are immune to dust, dirt or corrosion, thereby eliminating contact cleaning.

Bulletin No. 85 is available.

More Information? Circle Item 35 on postcard, page 141

Corrugated Aluminum Jacketing

A new type of jacketing which can be applied with pliers and screwdriver, made of weather-proof, moisture-proof corrugated aluminum, is announced by Childers Mfg. Co., Houston, Texas.

Corrugated jacketing comes in rolls 4 ft wide and is designed to fit over any type of molded insulation. It is available with glued-on asphaltic moisture barrier. The new jacketing fastens on quickly with aluminum strapping, plastic film tape, or screws. No painting is necessary.

The jacketing is said to save money three ways: low maintenance cost, low initial cost, and low application costs.

More Information? Circle Item 36 on postcard, page 141

Glass Lined Water Heater

The TD glass lined gas hot water heater is introduced by Downs Engineering Co., Springfield, Mass.

The unit has a fully insulated tank and carries a 10 year guarantee. It is made in 20, 30 and 40 gallon sizes for both natural and LP gas.

According to the company, the unit has a spherical, glass lined tank with no corners; thus it is entirely glass lined and rust proof. It is also said that hot spots cannot occur in the heater, because the products of combustion never come in contact with the tank. The tank is a unit apart from the heat exchanger. It is in the heat exchanger that the water is heated, then delivered to the top of the tank.

More Information? Circle Item 37 on postcard, page 141

Plastic Pipe Measure Marked

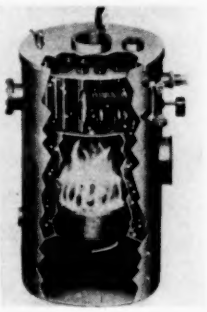
A new, convenient, positively identified flexible plastic pipe is being marketed by The Plastex Pipe and Extrusion Co., Columbus, Ohio. Trade name for the pipe is Plastex Measure Marked Pipe, so-called because the name is permanently impressed into the pipe in a contrasting color at exact 10 foot intervals throughout the coil. This enables the dealer to easily count out any given amount without bothersome measuring devices and also gives a quick inventory of partly used coils. In the field, installations are speeded up because any measurement can be quickly and accurately calculated to a fraction of an inch with an ordinary pocket rule.

The pipe is made in one grade of pure polyethelene and is guaranteed non-toxic. Pipe sizes are from ½ to 6 inches.

More Information? Circle Item 38 on postcard, page 141

Domestic Rotary Flame Boilers

A new flue pass and internal drum construction for its line of rotary flame steel boilers, adaptable to the domestic rotary wall flame oil burner, is announced by Portmar Boiler Co., Inc., Brooklyn, N. Y.



Flue pass walls are now 3/8 inch steel thickness, and the firebox crownsheet has been built higher to permit complete combustion of gases through these new flue pass walls. The company states that this new construction has resulted in higher heating efficiencies because of lower stack temperatures.

Available in four sizes ranging from 77,000 to 216,000 Btu per hr, the residential boiler is developed for the small and medium home, to provide low cost heat and abundant year-round domestic clean hot water. It is compact and vertical in design, requiring little floor space and rapidly installed.

More Information? Circle Item 39 on postcard, page 141

Redesigns High Vacuum Pumps

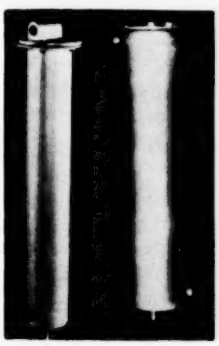
Design improvements intended to reduce both operating and maintenance costs in its line of vacuum pumps are announced by C. A. Dunham Co., Chicago, Ill.

A new split packing nut in pump water ends assures speed and simplification in repacking. Smaller horsepower motors are now being used to pull and maintain vacuums as high as 26 inches. A new suction check valve has been added to assure quieter pump operation.

More Information? Circle Item 40 on postcard, page 141

Two Heavy Duty Filters

The addition of two new heavy duty filters for removing water and oil from compressed air lines to its line is announced by Air-Line Engineering Co., Mansfield, Ohio.



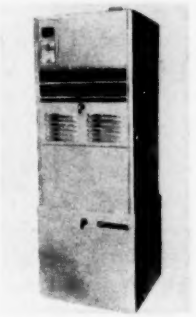
One type of filter has a steel outer shell 6 inches in diameter and 36 inches long, and a steel inner cartridge 24 inches in length by 5 inches in diameter. The inner cartridge has a removable perforated bottom disc. A cast bronze head with inlet and outlet openings is bolted to a flange welded to the outer shell, and the cast head overlaps the flange to provide for additional pressure. The inner cartridge is packed with Fiberglas.

In addition to this unit, another heavy duty unit is presented in the form of a water cooled filter, the construction of which is identical with the previously described filter, with the exception that a steel jacket 8 inches in diameter has been added to the standard condensing filter which permits a flow of cooling water around the outer shell. The water cooled filter thus functions as a combined aftercooler and filter to provide maximum condensation.

More Information? Circle Item 41 on postcard, page 141

2, 3 Ton House Air Conditioners

A new line of small residential year-round air conditioning units has been brought out by Typhoon Air Conditioning Co., Inc., New York, N. Y. Designed for the modern basementless home selling for under $15,000, these Model SW units occupy about 5 square feet of floor area.



The units are rated at 2 and 3 tons of cooling capacity, with heat input ranging between 75,000 and 140,000, and output between 60,000 and 112,000 Btu per hour. Models are available for use with both gas and oil, and all models can be furnished for use with either water cooled or air cooled condensers.

The Upright model (illustrated) is designed for overhead air distribution. It has a floor dimension of 28 3/8 by 29 3/8 inches, which makes it valuable for installation in utility rooms or closets. The overall height of the unit is 80 inches, allowing sufficient clearance in the standard basement. For installations using the perimeter system of air distribution, the line includes a counterflow model with the same floor dimensions as the upright. For larger homes where greater cooling capacity is required, back-to-back models are available in capacities up to 5 tons.

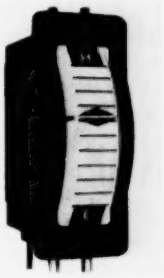
All models feature the automatic changeover design which, by eliminating the need for dampers, damper motors, or damper controls, allows the owner to switch from heating to cooling by flicking a switch on the wall thermostat located right in the living room or hall.

A special cross-pilot safety feature is included in all models using gas for a winter fuel. A solenoid control prevents gas from flowing into the main burners unless the entire cross pilot is lighted, thus making accidental gas leaks impossible.

More Information? Circle Item 42 on postcard, page 141

Improved Level Indicator

Easier readings of liquid levels are made possible by a new type face and cover plate on Yarway remote liquid level indicators, according to Yarnall-Waring Co., Philadelphia, Pa. The raised, transparent face permits the indicator arm to be extended under the cover to a position where it can be viewed from the side as well as the front. This improved visibility makes it possible to check boiler water levels or other liquid levels from most any location in the control room or wherever the Yarway Indicator may be installed.

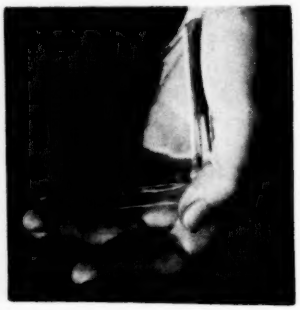


The indicating mechanism is operated by the boiler water itself, assuring instantaneous, accurate readings. Indicating mechanism is never under pressure. There are no stuffing boxes.

More Information? Circle Item 43 on postcard, page 141

Insulating Windows

An all-glass double-glazed insulating window, edges of which are electrically fused to provide a glass-to-glass seal having no metals, bonding materials or other assembled parts in its construction, is announced by Pittsburgh Plate Glass Co., Pittsburgh, Pa.



Known as TwindoWeld, the product is an insulating window, having all the advantages of the assembled double-glazed units now on the market plus the permanency of true glass-to-glass sealed edges. The window, having no metal in its construction, eliminates edge conductivity, making it particularly desirable for refrigeration and air-conditioning applications. It is specifically designed for residential glazing, apartments, schools and all other building applications where large quantities of relatively small size insulating units may be utilized. It is available in sizes up to 50 inches by 62 inches.

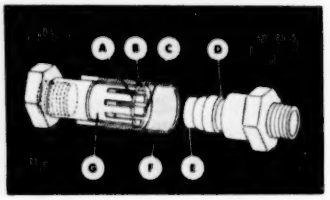
The window consists of two layers of ⅛ inch thick glass separated by a 3/16 inch air space. The air between the two panes of glass is removed in the manufacturing process and replaced with especially dried air. Internal air pressures are adjusted to enable the insulating units to withstand atmospheric pressure in all parts of the United States having altitudes under 3,000 feet.

Heat transfer properties are the same as for the assembled insulating windows now being manufactured. Under average conditions the new units will reduce the amount of heat transfer by about one-half of the normal amount transferred through an equivalent area of conventional single-glazed windows.

More Information? Circle Item 44 on postcard, page 141

Quick Coupling for Pipe

The quick coupling principle, developed for the aircraft industry, is being offered by Corley Sales and Engineering Co., Dayton, Ohio, for adaption in other industries. It is applicable to a variety of uses from flexible cable or tubing to hose and pipe. Standard checks can be incorporated in the design when shut-off is essential. Any standard connections can be adapted to either end of the coupling.



To couple, the sleeve is moved to the rear the appproximate distance *F*, allowing the fingers of the collett to expand slightly. The male portion is then inserted. As the sleeve is then moved forward, the shoulder *C* engages over shoulder *D*. As this engagement is completed, ribs *A* seat in slot *B*, locking the coupling. Reverse movement of sleeve provides immediate disconnect.

More Information? Circle Item 45 on postcard, page 141

Valve Has Plastic Packing

Spring-loaded plastic packing, requiring no maintenance and suitable for both steam and hot-water systems, is featured in a new pneumatic radiator valve developed by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Called the V051A, the valve is a direct-acting, fully modulating type designed for radiators and convectors having limited installation space or requiring neat appearance. It is suitable for concealed convectors and all other convector and cabinet-radiator applications where space is at a premium.

Teflon plastic packing, the company said, never needs adjustment and will not stick or leak even after remaining in one position all summer.

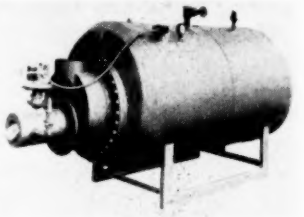
Moreover, the valve can be repacked under pressure without shutting off the radiator or convector. This is made possible by a new back-seating feature and is particularly advantageous on water systems, since it eliminates the necessity of their being drained.

The valve comes in four body styles, each available in four port sizes and two pipe sizes. Space problems that usually confront the installer when hooking up radiators or convectors are eliminated, for the small-sized operating assembly can be easily unscrewed and removed to facilitate body installation, and the operator can be fully rotated to permit easy connection of the air line in any position.

More Information? Circle Item 46 on postcard, page 141

Immersion Type Water Boiler

An immersion type 2-pass hot water boiler that combines heating element and water storage tank in one unit, saving in floor space with additional savings in fuel, is announced by Mund Boilers, Inc., Los Angeles, Calif. The boiler is available for commercial and industrial application in capacities from 250 to 5000 gph with either gas or oil firing or combination.



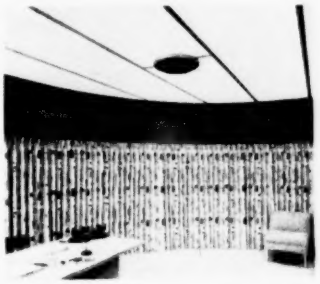
Since the heating element and water storage tank are combined in one unit connecting piping is eliminated and time and costs saved in installation. The heating element alone may be installed in present water storage tanks effecting savings over the cost of a complete unit where present storage tanks are suitable for the substitution of the heating element alone.

The heating element is completely immersed in the water storage tank. The heating element itself is easily removed for inspection and a large manhole at the rear of the unit permits quick accessibility to the interior of the boiler. The boiler is Fiberglas insulated throughout, enclosed in a metal outside cover.

More Information? Circle Item 47 on postcard, page 141

Dropped Luminous Ceilings

Acousti-Luminous ceilings diffuse room illumination and permit good air diffusion as well, by using a plenum chamber above the ceiling to serve as an expansion chamber. These units are introduced by Luminous Ceilings Inc., Chicago, Ill.



A 1/8 inch opening at each side of the corrugated Lumi-Plastic sheet provides equal distribution throughout the area with either heating or air conditioning. By providing a dropped ceiling (the 13 to 36 inch drop provides plenum chamber area) at desired level, the ceilings also provide diffusion of glareless light in like manner. Simple strips of fluorescent lights are attached to the ceiling, under which is hung the pearly white plastic ceiling on acoustical fins. These acoustical fins made of white enameled perforated steel, contain glasswool sound absorbing pads. These baffles also act as louvers to shield light source and destaticising.

Usual method use as ductless diffuser is accomplished by introducing air from supply to area above ceiling, from which it filters through equal openings evenly throughout area.

More Information? Circle Item 48 on postcard, page 141

Filter for Smaller Oil Burners

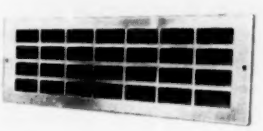
The new Micronic fuel filter, designed to give protection for small and medium-sized oil burners, is placed on the market by Purolator Products, Inc., Rahway, N. J.

The filter features a depressed head for non-spill removal of the replaceable element that traps all dirt, tank and pipe scale, and solid impurities exceeding a dimension of 0.0002 of an inch. The element has over 200 sq. in. of filtering surface and a gravity flow capacity of more than 100 gph. The element is rated for 7,000 gallons per year dirt retention life.

More Information? Circle Item 49 on postcard, page 141

Extra Low Grille for Kitchens

The No. 334 grille, designed for use in the toe space of kitchen cabinets, for window sills, stair risers, and similar locations, is announced by Air Control Products, Inc., Coopersville, Mich. Its unusually low height, only 3⅝ inches, makes it ideal for such uses.

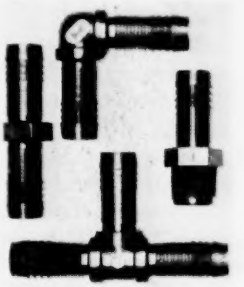


It is made from a single piece of heavy-gage steel and stocked in only one size, 14 by 2¾ inches. Full-depth grids insure strength and help conceal the openings. It is finished in beige prime coat and comes complete with installation screws.

More Information? Circle Item 50 on postcard, page 141

Plastic Pipe and Fittings

A complete line of its Durex flexible plastic pipe and plastic fittings (illustrated) for farm, home, and industrial application is available from Franklin Plastics, Inc., Franklin, Pa.



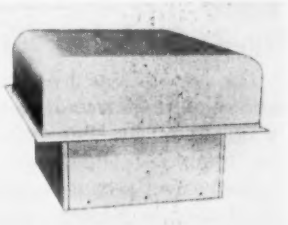
Flexible plastic pipe is molded of virgin polyethelene and has smooth interior and exterior contours. The pipe is thirteen times lighter than steel, has one and one-half times less friction loss than steel, and can easily be cut to length with a pocket knife. Freezing has no harmful effect upon the pipe.

A complete range of sizes and types of plastic fittings is also available, molded of virgin polyethelene. Fittings have hexagonal centers that permit the use of an ordinary wrench for loosening. These fittings feature barbs that assure leak-proof joint. The size is plainly marked on the hexagonal face of each fitting. No special tools or skills are required. The firm's line of plastic fittings is available to other manufacturers with the latter's names on them.

More Information? Circle Item 51 on postcard, page 141

Industrial Roof Exhauster

Expansion of its industrial ventilating line to include Skymaster roof exhausters, a belt-driven, propeller type unit with non-overloading blades, is announced by Acme Equipment Co., Muskogee, Okla.



Housing is galvanized steel further protected by a corrosion resistant finish. Unit is easily serviced by tilting the hood and removing access door. Available in sizes 24 through 60 inches in 33 models, certified ratings are given on air deliveries against pressures up to ⅝ inches S.P. Remote drive for exhausting air with temperatures up to 175F is also available. Back draft dampers and birdscreens are optional.

More Information? Circle Item 52 on postcard, page 141

Fittings Have Butyl Seals

Its Quikupl stainless steel fittings are now available with Butyl rubber seals, according to an announcement by the Cooper Alloy Foundry Co., Hillside, N. J.

Butyl seals will permit the use of fitting installations in a great variety of corrosive conditions and services. These seals are said to be particularly effective in handling sulfuric, hydrochloric, phosphoric and acetic acids, and also in alkalies and hypochlorites.

Resistance to nitric and chromic acids is another feature of these seals. Neoprene seals will continue to be standard, but no additional charge will be made when Butyl is requested.

More Information? Circle Item 53 on postcard, page 141

Filter Driers Use Fiberglas

A new free-flow filter-drier, the Super Flo, combining in a low price unit a Fiberglas depth filter, a molded drying element, and a spun-end copper shell, to meet the needs of air conditioning and refrigeration systems, is introduced by Remco, Inc., Zelienople, Pa.

Fiberglas bag in the filter removes large amounts of foreign matter from the refrigerant stream. In actual test, 100 drops of crank-case sludge injected directly into the stream were completely removed on the first pass through a one-ton filter-drier unit. As a safety feature, a 30 by 150 mesh Dutch weave outlet filter stops all particles larger than .0046 inches.

The molded Remcal drying unit removes moisture both chemically and physically, also adsorbing acids to a level below possible danger from corrosion. Chemically absorbed moisture is retained in the drying element even though temperatures rise to 150F.

There is no pressure drop through the filter-drier because of the design of the flow channels and flow graduators and the availability of the Fiberglas for filtering. Flow channels permit the refrigerant to flow in direct contact with the drying agent for fast moisture removal.

More Information? Circle Item 54 on postcard, page 141

By-Pass Valve for Conditioners

The No. 48 line by-pass valve, designed for manual control of year-around room-type air conditioning units, is announced by Ohio Brass Co., Mansfield, Ohio.

The valve permits some circulation in winter, even when the valve is closed, to prevent freezing. In summer when the unit is used for cooling, the by-pass is turned to the closed position to eliminate the danger of excess condensation.

Having a ⅛-inch pipe plug outlet for venting or additional by-pass service, the valve is designed for pressures up to 150 psi and comes in the ½-inch size only.

More Information? Circle Item 55 on postcard, page 141

Plastics Control Solar Heat

Two Thermoglare anti-sun protective products, in the form of spray-on plastic film and a sheet plastic, are produced by Eastern Industrial Service, Inc., Cambridge, Mass.

Laboratory and factory tests reveal the products will filter out blinding ultra-violet rays up to 95 percent, reduce transmission of hot infra-red rays up to 80 percent and eliminate sun-glare problems. Protection against the sun's heat, glare, and ultra-violet rays in this form of thermoplastic has been successfully field tested on textile mills in the South for more than three years. The products are weather resistant.

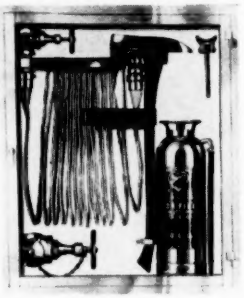
Both are translucent, coming in two colors, blue-green and frost white. They provide highly desirable diffused working light. Further shading of factories is unnecessary when they are used. The sheet plastic is shatter-proof and is designed to be used instead of glass window panes.

Applicable to many industries, including textile, canning, aircraft, petroleum, as well as in the home and school in areas where glare, solar heat, and ultra-violet ray tranference are problems; they can also be effectively used in cold climates, especially on military bases, for thermal insulating properties.

More Information? Circle Item 56 on postcard, page 141

Fire Protection Package

A complete fire protection package for stores, factories, hospitals, schools and other public buildings, furnished in a wall cabinet with satin-finish extruded aluminum door and trim, has been introduced by the Elkhart Brass Mfg. Co., Inc., Elkhart, Ind. Feature of the package is that it may be installed after plastering so that the trim and door are kept free from damage during construction.



The hose cabinets are available in a variety of sizes to meet local requirements. Door rails are assembled through a patented mechanical process; they are of tubular construction giving great rigidity.

The typical hose cabinet door, factory glazed, cushioned in concealed rubber channels, puts on view the contents of the cabinet, including a 1½-inch angle valve with 75 feet of 1½-inch unlined linen hose mounted on a one-piece rack, and equipped with fog nozzle, a 2½-inch valve to be used by local fire fighters, a 2½-gallon 500-pound tested brass drawn shell fire extinguisher, fireman's axe and spanner wrench. Cabinets may be made also to hold a hand extinguisher only. Standard sizes come in five widths and three heights.

More Information? Circle Item 57 on postcard, page 141

Oil Burner Filter for Boilers

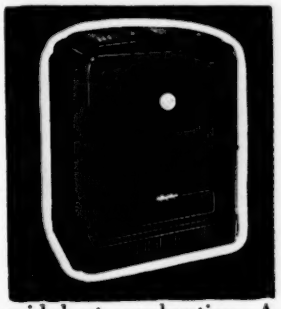
The new oil burner model Fulflo filter which is connected to the boiler for a steam or hot water system, preventing formation of scale, is introduced by Commercial Filters Corp., Melrose, Mass.

The filter is connected between the sight glass or blowdown opening of the low water cut-off, and the boiler drain cock or at a point where the return line enters the boiler. The unit requires some fittings and valves for connection. The filters contain Honeycomb filter tubes and the boiler water will flow through the filter by natural thermal circulation when the boiler is in operation, and the filter and the line from its outlet will be hot. If the outlet line feels cold while the boiler is in operation, it is probably time to replace the filter.

More Information? Circle Item 58 on postcard, page 141

Oil Heater Has Extra Radiator

A new oil heater in two models, the H-822 and H-823, both having a 78,000 Btu per hr output and both equipped with Midget pilots and Multi-Heat burners, is introduced by Perfection Stove Co., Cleveland, Ohio.



Large heat director doors at the sides of the heater units swing open to reflect heat where it is wanted. The extra radiator or heat exchanger on these models adds valuable radiating surface. Lighter opening at the burner level provides for instant, positive lighting and rapid heat acceleration. A spring-action flexible plunger makes cleaning of the fuel line a fingertip-controlled job.

A removable porcelain-enameled top grille which facilitates dusting, a waist-high finger-tip heat selector, an automatic draft regulator, leveling screws, and a comfort-promoting humidifier are included.

On Model H-823 there is a factory-installed Floor Flo Blower which propels warm air across the floor as a carpet of warmth. On both models, several accessories are available, including an automatic thermostat, automatic oil-air control, an attached reservoir, and a fuel pump for use when the storage tank is lower than the heater.

More Information? Circle Item 59 on postcard, page 141

Wall Hung Closet Bowl

A new wall hung closet bowl, a blowout flush valve model with elongated bowl, has been added to the vitreous china line of Briggs Mfg. Co., Detroit, Mich.

Called the Noble B-6592, it has a 1½ inch top spud for flush valve and is usable with a Zurn or equivalent closet carrier. A minimum of 25 pounds working pressure at the bowl is required for satisfactory operation.

The blowout bowl depends upon a driving action of water for its efficiency rather than upon syphonic action in the trapway. It is economical in the use of water and has a large unrestricted trapway. It is for use in offices, hospitals, schools and public and industrial buildings.

More Information? Circle Item 60 on postcard, page 141

Flexible Duct Insulating Liner

A new product known as Flexible Duct Liner, for insulating the interior of air conditioning or warm air ducts is introduced by Owens-Corning Fiberglas Corp., Toledo, Ohio.

Having a high noise reduction efficiency, the liner effectively reduces sounds that normally travel through air ducts. It also has excellent thermal insulating properties and when used inside of ducts allows the metal surface to act as a vapor barrier, thus preventing condensation on those ducts carrying cool air through areas of high humidity.

Because of its flexibility, the liner may be installed on metal sheets before they are bent to form ducts. It is cut to match the size of the unformed sheets and adheres to the sheets, which then are formed in a sheet metal brake to produced a completed duct with the liner already installed. The insulation is sprayed with a light coating of fire-safe neoprene to prevent erosion by high-velocity air and to reduce frictional losses.

More Information? Circle Item 61 on postcard, page 141

Temperature Relief Valves

The Acme type V Series Econo-Therm relief valves, low cost valves affording automatic reseating temperature and pressure relief safety and protection for hot water storage heaters, is announced by A. W. Cash Valve Mfg. Corp., Decatur, Ill.

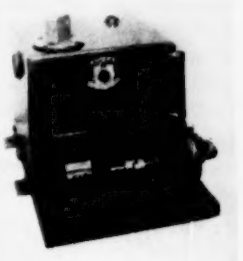
In order to maintain water in hot water tanks and heaters at safe normal temperatures, water above 208F is allowed to escape by way of a temperature actuated relief valve. The temperature actuated device is a patented thermostatic device, containing no fluid, which will withstand high temperatures without deterioration, and will not wear out with use. It acts as a thermostat, opening the valve when water reaches 208F, closing when the water is sufficiently cool.

Valves are available in regular and stem type, with or without try levers. The regular valve is for hot water storage heater installation, and the stem type is recommended for electric heaters, insulated tanks, and installations wherein close nipples cannot be used.

More Information? Circle Item 62 on postcard, page 141

No Pit for Condensate Pump

A condensate pump which does not require a pit even though return pipes are as low as a foot above the floor is offered by Walter H. Eagan Co., Inc., Philadelphia, Pa. It handles 3000 square feet of radiation at 20 psi.



The pump contains an all bronze centrifugal pump and flexible couplings which isolate the pump from the motor and piping, preventing pipe cramp, misalignment, wear and noise. Power is supplied by a ¼ hp, 115 volt, single phase motor mounted on a drip-lip, heavy structural steel base with a ½ inch drain.

More Information? Circle Item 63 on postcard, page 141

Submersible Sump Pump

A submersible sump pump with a capacity of 2650 gph against a 12-ft head is placed on the market by Bruner Corp., Milwaukee, Wis.

A ⅓ hp Franklin 115 volt 60 cycle alternating current submatic motor, having permanently lubricated sealed ball bearings, is used. A sealed stainless steel housing serves as float and automatic switch control. Built-in automatic overload protection is featured.

No water can reach working parts or windings. Neoprene-jacketed waterproof and age-resistant cord and plug set is sealed into housing. No float adjustment is necessary. Operating range is set at the factory, and the entire unit installs below floor level and can be controlled manually by applying tension on handle.

Two models are available, SB-1, using a bronze body, and SM-1, using a cast iron body with cadmium plated brass impeller.

More Information? Circle Item 64 on postcard, page 141

Gas-Fired Horizontal Furnace

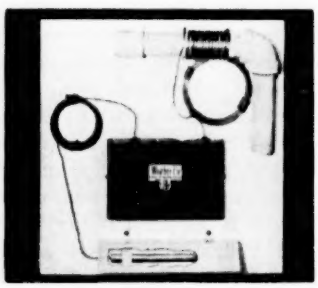
Expansion of its horizontal furnace line to include a new 70,000 btu per hr model is announced by Sequoia Mfg. Co., San Carlos, Calif.

The new unit is the fifth size available in the range of horizontal furnaces, 80,00 to 150,000 btu per hr sizes having been produced previously. The new model is designed specifically to meet FHA-VA minimum heat requirements. It retains the same measurements which have been used in this type of gas-fired winter air conditioner for zone heating and single-floor homes; 42 inches in over-all length, 17½ inches high, and 16½ inches wide. This model features a direct drive and BX-69 controls.

More Information? Circle Item 65 on postcard, page 141

Improved Heat Controller

The Weather-Flo, a simplified form of indoor-outdoor building heat controller, has been developed by Automatic Devices Co., Inc., Western Springs, Ill. An outdoor thermostatic bulb measures weather conditions and resets a system thermostat that measures and changes the temperature of the water being circulated as the outdoor weather changes.



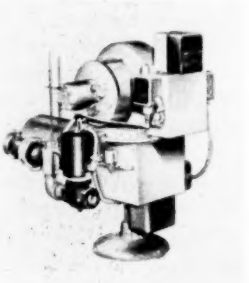
Constantly circulating water at weather modulated temperatures eliminates peaks and valleys of temperature indoors, keeps floors warmer and heats the last hard-to-heat radiator as well as the near radiator. It eliminates gurgling air noises and noises of expanding pipes rubbing on joists, etc. By eliminating the lag of the ordinary room thermostat, it increases burner, boiler and radiator capacity.

To cut installation costs in half, a 6-foot length of flexible soft copper tubing has been substituted for the usual bulb on the unit. This makes it possible to install the unit on an existing heating system without draining the system or cutting into the piping. The flexible tubing is simply wrapped around the pipe accurately to measure the temperature of water being circulated.

More Information? Circle Item 66 on postcard, page 141

Forced-Draft Gas-Oil Burner

Incorporating a forced draft gas burner with a gun-type oil burner, a packaged unit for efficient burning of either gas or oil is marketed by Siemon Mfg. Co., Kansas City, Mo.



These units are available in capacities from 100,000 to 3,000,000 Btu per hour, using light oils and either natural, mixed, or LP gases.

Operational sequence includes both pre-purge and post-purge periods to clear the heating plant for safe operation. Fuel selection is automatic by temperature change or by means of a selector switch.

All burners, including controls, are factory assembled, wired, and tested. Connections needed are operating control, power, and fuel supply.

More Information? Circle Item 67 on postcard, page 141

Two-Temperature Water Heater

A new storage type water heater, called the Sanimaster, which simultaneously provides hot water of two different temperatures from its single tank, is produced by Ruud Mfg. Co., Pittsburgh, Pa.

Designed primarily for commercial kitchens, the unit has two hot water outlets. From one outlet comes sanitizing water at 180F for dishwashers A second oulet provides general purpose water at 140F, for uses such as sink and customer lavatories.

Cold water enters the tank at the bottom. Tank temperature is automatically maintained at 180F. Water at this temperature flows from the upper hot water outlet. Tempered hot water (at approximately 140F) flows from the lower hot water outlet. Temperature of this water is controlled by a built-in system of flow valves which mixes the hot and cold water at set flow-ratios.

Metals are utilized to guarantee high, efficient output of clear, rust-free hot water. The solid Monel metal water storage tank cannot rust. The outer jacket and top of the compact heater are heavy-gage prime cold rolled steel, finished in hard baked two-tone gray porcelite. The sub-top is extra-heavy gage steel, compound treated. Liner material is aluminized steel. Tank, combustion chamber, and sub-top are blanketed in fiberglas insulation.

More Information? Circle Item 68 on postcard, page 141

What Would You Do?

Replies to engineering and operating problems of interest to the industrial plant engineer

Conducted by
NATHAN N. WOLPERT
Associate Editor

EVERY industrial plant engineer has had experience with motors, and at some time or other, may have been alarmed that his motors were running too hot. Just what squirrel-cage motors will stand in the way of temperature provides the basis of this discussion.

Should you have a problem that you would like to see treated in this department, or if you would like to add your comments to a problem scheduled for later discussion, you are invited to write to the Editor. Such letters are always welcome.

This Month's Problem

How much temperature will a squirrel cage motor stand? Some of our motors after they have been operating for some time are exceedingly warm to the touch and I am alarmed that it may break down the insulated coatings on the windings. What is generally considered an allowable temperature limit?

Answers to this Month's Problem

Virtually all of the motors used to operate heating and ventilating equipment are constructed with Class A insulation. This insulation involves the use of cotton and resinous coated wires with various types of paper, linen or cotton materials for slot insulation and phase insulation. The entire winding is usually covered or impregnated with an insulating varnish. Insulation of this class is good for a maximum hot spot temperature of 221F or 105C. For more severe service, Class B insulation is available. This class of insulation includes glass, asbestos and mica and is good for a hot spot temperature of 257F or 125C.

For some applications, Class H insulation has been used. These special application motors are usually designed for a very high output for short periods of time. This class of insulation makes use of glass and ceramics, and is not generally available for starting motors. No definite temperature limits have been set for this class of insulation.

High temperatures have a definite effect on organic insulation. It is generally accepted that the life of organic insulation is cut in half for each 10C rise in temperature. A motor with a 104F or 40C temperature rise operating in an ambient of 104F might last 20 years. By changing the rise to 122F or 50C, the life expectancy of the insulation becomes 10 years. Raise it to 140F or 60C and the life expectancy goes down to 5 years.

Many people attempt to measure motor temperatures by laying their hand on the motor. Sometimes a motor feels uncomfortably warm when touched, and this causes unnecessary worry and service calls. It has been reported that any object having a temperature of more than 150F is considered too hot for comfort and would result in an uncomfortable feeling when touched.

Allowable temperature rise for general purpose open motors is 40C above a 40C ambient. This gives a total rise of 80C or 176F. When motors are operated at service factor loads, this total rise is increased approximately 10C bringing the final temperature to 90C or about 195F. The total temperatures are even higher for enclosed or partially enclosed motors where the permissable rise is 50C or 55C (131F). From this, it is easy to see that fully loaded motors reach temperatures well above 150F, and would feel hot when touched, although they are operating in a perfectly normal manner.

When the temperature of a motor seems to be unusually high, a therometer should be used to obtain the actual temperature rise. This can be done by placing a mercury thermometer on the motor frame, and covering the bulb with putty or felt.

George Nafe
Manager, Sales Service Section,
Century Electric Co.
St. Louis, Mo.

The rating of a squirrel-cage induction motor is found on the same plate which is attached at some convenient

Problems for Coming Issues

July Issue

We will soon be faced with the problem of drying a sludge and also a granular material. We would like to know what type of equipment should be used for this drying. What determining factors are important in deciding on the proper equipment?

August Issue

Most manufacturers of steam unit heaters in their suggested pipe hookups show one or two arrangements omitting a return trap. Since in commercial and industrial work, most unit heaters are connected with two-pipe steam systems under positive pressure with the return line usually high, when and where is the elimination of traps in unit heaters justified?

location on the outside of the motor frame. This rating states the horsepower the motor will deliver when properly connected to its supply indicated by the voltage, phases, and frequency shown. This rating also states the speed in revolutions per minute and the current in amperes that correspond to the rated horsepower, together with the temperature rise the motor will incur in dissipating its losses.

Generally, this temperature rise portion of the name plate rating is expressed in degrees Centigrade (°C) and is further described as being for continuous duty (Cont.) or intermittent duty as indicated by a specific time of operation such as one-half hour, 2 hours, etc., at a specific ambient or inlet air temperature. It would be well to check the information on the name plate.

To establish the guaranteed maximum observable temperature of the motor, it is necessary to add the name plate temperature rise to the name plate ambient or inlet air temperature. Thus, if the name plate shows that the motor is rated 50C rise cont. in a 40C ambient, the maximum guaranteed operating temperature of the motor is 50C plus 40C or 90C at rated load conditions. This means that the life expectancy of the insulation in a machine so rated should be normal if the machine were operated continuously at a maximum observable temperature of 90C or 194F. These temperatures are not far from the boiling point of water and if the operator happens to get his hands near enough to the hottest parts of the machine, it would be very hot to the touch, to say the least. If a motor is suspected of overheating, the use of thermometers or thermocouples is recommended rather than the sense of touch.

Gaylord Brooks
Design Engineer, Motor and Generator Section,
Allis-Chalmers Manufacturing Co.
Milwaukee, Wis.

The electrical industry has established that a maximum hot spot temperature of 105C is satisfactory for most forms of rotating machinery with Class A insulation. In general, this is an insulation temperature which will be encountered in warm weather under conditions of heaviest load and longest load cycle. For normal applications, there will be periods in which the hottest spot of the motor will be at a temperature that is somewhat below that of 105C.

Under this condition of service, rotating machinery will, in general, provide not less than a commercial minimum of service. This is often looked upon as 20 years of life, but this is a factor that is somewhat variable and depends upon the size of the machine.

The temperature of the frame, when the hottest spot of the motor is at 105C, will depend upon the ventilating system that is used in the motor. For a plain, totally-enclosed motor, the frame temperature will be relatively close to the winding temperature. For open designs, with ventilation between the frame and the core structure, differences in temperature will be much greater. Frequently the frame temperature of well ventilated machines will be 30 and 40 degrees lower than the temperature at the windings. However, for the average design, the frame temperature will be a value somewhat above that at which one's hand could be held in comfort. That is why some are alarmed by the high degree of warmth discovered through the sense of touch.

Unless unusual conditions exist, the motor users can usually feel that the motor insulation is not being subjected to excessive temperatures if the current that is being drawn at rated voltage and frequency is in line with the name plate stamping.

Robert F. Munier
Chief Motor Engineer,
The Emerson Electric Mfg. Co.
St. Louis, Mo.

Previous Problem

The following discussion is in reply to a previous question on an arrangement for heating the oil feed line to a burner to promote good oil flow where heavy fuel oil is used:

An effective, and we believe foolproof method of handling heavy fuel oil from an outside tank to a burner is based on the use of a steam heater and a small electric heater located inside the boiler room.

The section of oil line from the tank to the boiler room is a 3-inch line with a 1½-inch return line running through this line. All outside lines are wrapped in hairfelt, tarfelt, and tar. The section is taken from a 6-inch well in the oil tank, the return oil being returned to this well.

The electric heater is used only until steam is available, when the boiler is being started.

This type system has worked on two different installations and during three heating seasons. Figure 1 shows the details of this system.

Dale Weum
Plant Engineer,
Red Owl Stores, Inc.
Minneapolis, Minn.

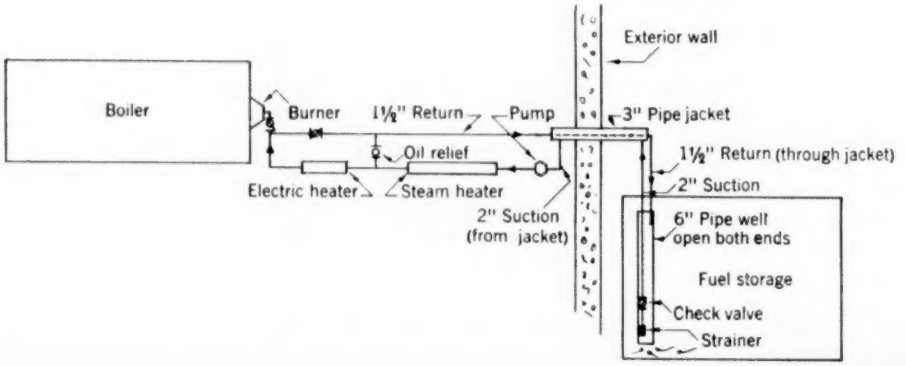


Fig. 1. Details of the method used by Dale Weum for handling heavy fuel oil.

Architect—Benjamin A. Crowther. General Contractor—Decker Construction Corporation, both of Elmira, N. Y. Heating Contractor—A. J. Eckert Company Incorporated, Albany, N. Y. Revere Dist. —LeValley-McLeod, Schenectady, N. Y.

ANOTHER CASE OF *Copper* WHERE IT COUNTS

This ultra-modern Motor Inn located just outside of Albany, N. Y., on Route 20 has all of its 100 rooms, lobby and dining room heated by radiant panel heat. Almost 24,000 feet of Revere non-rusting Copper Water Tube was used. A section of the control system is shown in photo at top right. System was designed for zone control, a most desirable feature of radiant panel heating. Note compactness and neatness of installation when you use Revere Copper Water Tube.

Now, with restrictions on copper ended, there isn't any reason why your next job can't have the many benefits of Revere Copper Water Tube for radiant panel heating, hot and cold water lines, underground service lines, processing lines, and waste stack and vent lines. See the Revere Distributor nearest you today. And, if you have technical problems, he will put you in touch with Revere's Technical Advisory Service.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities. Distributors Everywhere.

SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

WHY REVERE COPPER WATER TUBE IS PREFERRED BY

Architects, Builders, Plumbing & Heating Contractors

EASY TO BEND

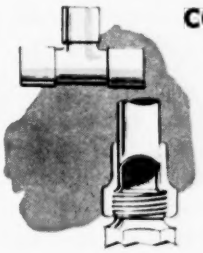
Saves Time

Revere Copper Water Tube is easy to bend. Soft temper can be bent by hand to meet installation conditions. Hard temper by hand bending tools.

HANDY LENGTHS

Save Fittings . . . Labor

Revere Copper Water Tube comes in straight lengths of 20' in hard and soft tempers. 60' coils of soft temper reduce the number of fittings needed.



SOLDER OR COMPRESSION FITTINGS

Need Less Work Room . . . Save Metal

No worry about wrench room when you use Revere Copper Water Tube with solder fittings. Compression fittings can also be used. No threading is necessary with either type fitting. Wall thickness of tube used can thus be less than for threaded pipe.

NEWS OF THE MONTH

AIR POLLUTION

responds to public opinion as demand for control measures spreads in many states and cities.

Bills proposing new or stronger state laws to curb air pollution were pending in mid-April in the legislatures of New Jersey and Texas, but were rejected earlier in Michigan, New York and West Virginia.

Meanwhile, pressure is increasing at both state and local levels throughout the country for intensified air pollution abatement progress under existing as well as new laws.

• **N. J.**—Two air pollution control bills await action in the New Jersey legislature, scheduled to reconvene May 18 after a five-week recess. One of the bills already has passed the Assembly and is now in the State Senate. Sponsored by Assemblyman Walter H. Jones, Bergen County Republican, it is similar to a proposal he unsuccessfully introduced last year.

The Jones bill would create a new agency within the State Law and Public Safety Department to be known as the State Air Pollution Control Commission. The new agency would have a $12,000-a-year full-time director and seven members receiving $25 per diem pay.

The other New Jersey bill, which has the backing of the State Health Department, was introduced by Assemblyman J. Peter Lassans, Essex County Republican. It would create an unpaid advisory committee of 16 members, to be reimbursed only for expenses, which would work within the framework of air pollution programs already being conducted by the State Department of Labor and Industry, Health and Agriculture.

• **TEXAS.**—An air pollution abatement bill introduced in the Texas legislature in mid-March had not yet been acted upon at this writing . . . A bill proposing the creation of a new state commission to combat air pollution in Michigan died in a state legislative committee.

• **N. Y.**—A bill unsuccessfully introduced in the New York State legislature would have provided for control of air pollution by industrial board from factories and places of work by establishing additional requirements to prevent discharge of air contaminants to outside air in such manner or quantity as to create nuisance or be injurious to health. The proposal was sponsored by Senator Carlo A. Lanzillotti of Long Island City and Assemblyman Anthony P. Savarese Jr., of New York.

• **W. VA.**—Legislation providing for the creation of a State Air Pollution Control Commission was passed by the West Virginia House of Delegates but died in the State Senate. The proposed three-member commission would have been empowered to combat such impurities as smoke, gases, fly ash and soot.

With the state health director and state agricultural commissioner serving as advisers, the proposed West Virginia agency would have been authorized to hold public hearings, summon witnesses, administer oaths and take testimony.

Duties of the West Virginia commission would have included: To develop means of preventing air pollution: inform the public of the problem involved and their solutions; adopt anti-pollution regulations, and to require registration of sources of pollution. Violators of the proposed law would have been subject to fines up to $25 daily.

• **NEV.**—Nevada's House of Representatives approved a resolution asking the State Industrial Commission to investigate alleged air pollution in the Henderson area and to take necessary steps to abate any health hazard that might be found.

In another development reported from Nevada, the Reno Regional Planning Commission is considering a model smoke control ordinance. Under the proposed measure, smoke would be limited to specified densities and regular inspections of fuel-burning devices would be required, in addition to preliminary inspection of the type of fuel burner and its installation.

• **CITIES.**—Steps were being taken at this writing in Baltimore to put into operation that city's first agency dedicated exclusively to abatement of air pollution by chemical fumes. City Health Commissioner Huntington Williams said that the new agency, being set up as a division of the City Health Department, will have the single task of controlling air pollution, particularly that caused by emission of chemical fumes from industrial processes. Abatement of smoke emission, it was explained, will remain the duty of the City Smoke Control Bureau, which is a unit of the City Department of Public Works.

It was announced that the new Baltimore agency would have a director with a starting salary of $6,500, a junior associate engineer to start at $4,600 and a principal chemist to start at $3,850. The division also will have three full-time inspectors. Expenses of the division for the current year will be met out of a special $25,000 appropriation included in the health budget.

Benjamin J. Linsky, head of the Detroit Smoke Abatement Control Bureau, announced early this year that 1953 studies in the Detroit and Windsor, Ont., area by the International Joint Commission would include the corrosion, vegetation and safety effects of air pollution. Past studies by the commission have led to new methods to control carbon and iron oxides from electric furnaces, and odors from paint and varnish.

Commissioner Leonard Greenburg of New York City's recently reorganized Department of Air Pollution Control put into effect revised methods of inspection of smoke offenses which resulted in increased collections of fines from $800 a month to $1,500.

Dr. Greenburg further announced that his department had moved to plug the loophole through which many installers of heating equipment escaped paying the required air pollution fees for making installations. As against estimates that the city should be collecting $200,000 a year from these fees, receipts had been $87,000. Dr. Greenburg requested the 1,100 dealers licensed to sell heating equip-

ment in the city to inform his department of all heating units installed or converted.

In a step to facilitate its intensified campaign against smoke offenders, the New York City Department of Air Pollution Control moved on April 1 from its former 3,000 square feet of office space at 140 Nassau St. to a suite of offices comprising 10,000 square feet at 15 Park Row. The department formerly was the Bureau of Smoke Control, a unit of the City Department of Housing and Buildings. It was reorganized last November as an independent city agency with the new name.

A basic change in inspectional procedure in the New York City program, Dr. Greenburg explained, has been abandonment of the former system of waiting for complaints before attempting to track down smoke offenders. Each of the department's 30 inspectors now patrols an assigned area and seeks to root out all violators.

• **OREGON.**—Oregon's State Air Pollution Authority early this year issued its first cease and desist orders against two Portland firms and announced it intended to proceed as rapidly as possible against other offenders.

The Oregon agency expressed hope, however, that cities and counties would assume the responsibility for solving their own local air pollution problems, permitting the state to confine its activities to establishing standards and providing technical assistance. An air pollution control ordinance was under consideration in Portland, with several other Oregon cities studying similar measures.

Meanwhile, Richard E. Hatchard, engineer in charge of the Oregon authority's field staff, reported the preliminary results of air pollution samples obtained at 118 stations in 38 communities showed North Bend in Coos County had the worst problem in the state. He added, however, more study was necessary to determine completely what the true picture would be.

North Bend was the only Oregon area tested having a pollution of more than 100 tons of materials in the air which would fall per square mile per month. Hatchard attributed this to large lumber mills in the area. The city of Coquille, also in Coos County, showed pollution of between 50 and 100 tons.

Oregon cities found by the survey to fall in the 25- to 50-ton class, which Hatchard said was sufficient to be a nuisance in residential areas, included Portland, Oswego, Coos Bay, Toledo, Newport, Klamath Falls, Nyssa and Roseburg. Cities having 10 to 25 tons were listed as Oregon City, Seaside, Sheridan, Newberg, St. Helens, Eugene, Hood River and Albany. Cities with 10 tons or less included Milwaukie, West Linn, Astoria, Corvallis, Hillsboro, The Dalles, Prineville, La Grande and Baker.

UNDERGROUND GAS STORAGE

increased to provide more heating capacity next winter. Ultimate capacity up 41% in 1952.

Greater supplies of natural gas will be made available to meet growing needs for househeating next winter, particularly in northeastern and mid-western states as well as Kansas and California, according to a report presented before the American Gas Association Transmission and Storage Conference in the Edgewater Beach Hotel, Chicago. Much of this increased volume will result from expanding capacity of vast underground reservoirs which soak up natural gas injected in warm weather to be withdrawn for winter use.

This information was contained in the second annual report of the subcommittee on statistics of the AGA Committee on Underground Storage. The report was presented by John B. Corrin, Jr., chairman of the subcommittee and superintendent of gas storage for Hope Natural Gas Co., Clarksburg, W. Virginia.

• **STATISTICS.**—By the end of 1952 there were 151 underground storage pools operating in 16 states, compared with an estimated 50 pools in 11 states in 1944, the AGA report disclosed. Ultimate capacity of existing underground natural gas storage pools was increased in 1952 to 41% beyond the previous year. Capacity was expanded from 916 billion cu ft of underground natural gas stored in 1951 to 1,290 billion last year. An additional 22% of storage capacity will be available upon completion of 17 underground pools now under way.

Existing underground storage pools, plus those being built at year's end, will have an ultimate capacity of 1,574 billion cu ft of natural gas, the report stated. This compares with a record capacity of 777 billion cu ft, the maximum amount of gas in storage at any time in 1952. However, that capacity is only half the amount ultimately to be stored in those pools.

More than 140 billion cu ft more natural gas was injected into storage than was withdrawn during the year ended October 31, 1952. This situation reflected both the relatively mild 1951-52 winter weather, as well as the need to inject considerable "cushion" gas into newer pools. The maximum daily withdrawal, during the period ended October 31, 1952, was 4.1 billion cu ft compared with a maximum of 3.2 billion cu ft extracted during the preceding year.

GAS APPLIANCES

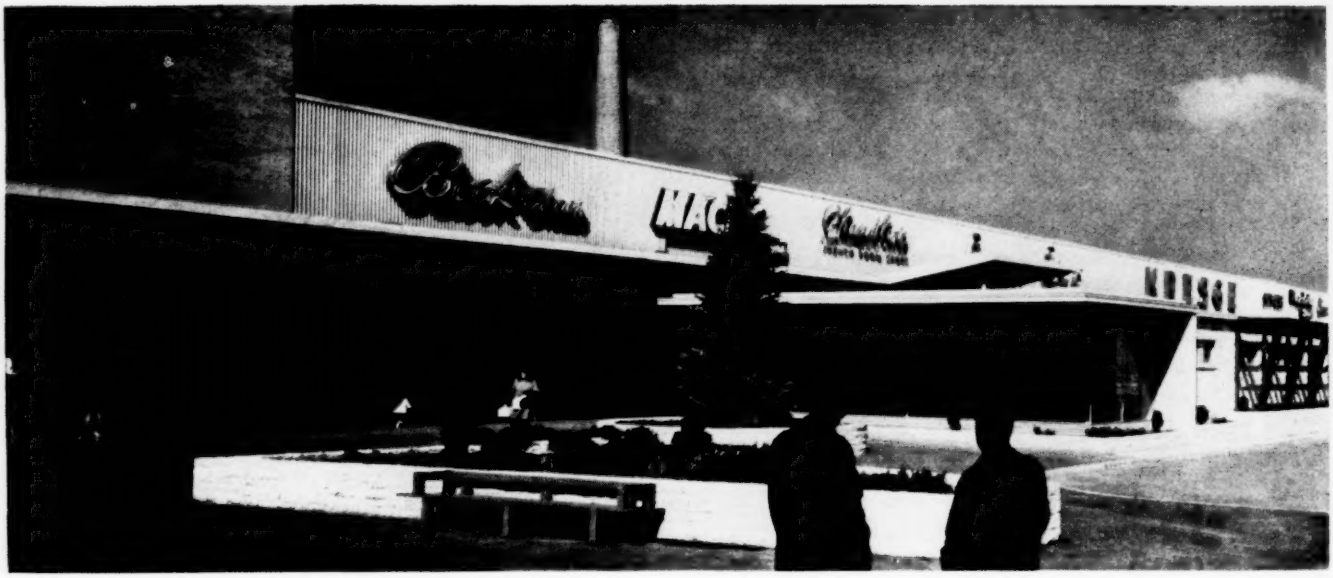
to show seal of compliance with ethics code adopted by GAMA. Building industry benefits from standard.

A seal signifying compliance with a self-imposed code of ethics and "symbolizing the highest standards of safety, performance and durability" in industrial gas equipment, including major installations used in the building industry, has been adopted by members of the Gas Appliance Manufacturers Association.

A. V. Leudemann, representing GAMA's industrial gas equipment division, explained this unprecedented self-policing action at a recent conference in Philadelphia. "It was prompted," he said, "by the fact that it has been found impossible to write a set of standards which would cover all of the more than 25,000 different uses of gas equipment in American industry."

• **CODE.**—By displaying the seal on their products, members of the division, who build gas equipment used extensively for heat-treating processes necessary for the manufacture of many components that go into buildings

(*Continued on page* 130)



How Honeywell Customized Temperature Control helps promote

a $40 million annual business!

Specially designed systems help make new Chicago shopping center one of nation's finest

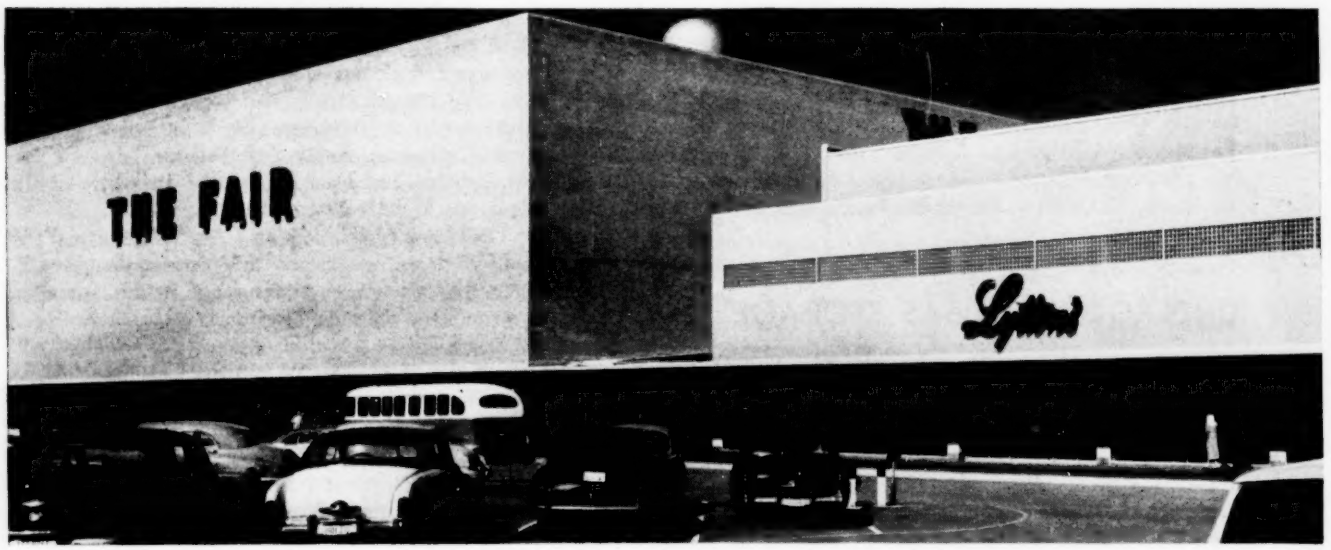
Evergreen Plaza is Chicago's newest (opened only last August) and biggest (6,100,000 cubic feet) shopping center. Projection of current business figures indicate that by the time the Plaza's first anniversary rolls around, turnover will have been $40 million.

Many factors account for the center's booming business. It's within easy reach of 500,000 shoppers. Nearly every type of retail outlet is represented. Parking space is generous, will accommodate 2,200 cars. Design is functional—and pleasant.

And most of the stores are equipped with Honeywell Customized Temperature Control—to help provide ideal customer comfort, good employee morale and economical use of fuel.

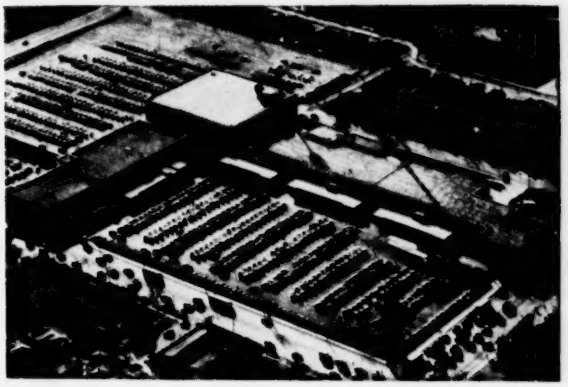
Individual stores chose the controls that best fit their needs—and budget. A wide variety of controls was available to choose from because Honeywell manufactures all three types of temperature controls—pneumatic, electric and electronic. And *only* Honeywell makes all three.

Large or small floor space, eastern or northern or southern exposure, occupancy by a small, select clientele or department-store-size crowds—all these varying factors were taken into account at Evergreen Plaza by Honeywell Customized Temperature Control.



Most of the smaller shops above have individual Honeywell thermostats. By adjusting these individual thermostats, store managers can provide the temperature employees and customers find most comfortable. Smokestack identifies project's central steam plant—controlled for most economical operation by Honeywell boiler room controls.

One or more thermostats on each floor of the larger stores below provides zoned comfort. Thus, in winter the first floor thermostat calls for heat required to compensate for cold air entering doorways, keeps first floor at same *comfort* level as other floors. Thermostats on other floors compensate for different occupancy, exposure and use problems found there.



Evergreen Plaza center was created by Arthur Rubloff, Arthur Rubloff & Co., Chicago; Howard T. Fisher & Associates, Inc., Architects & Engineers; Holabird & Root & Burgee, Architect-Engineer; George A. Fuller Company, Builders.

For comfortable, even temperature in new or existing buildings—of any size—use Honeywell Customized Temperature Control

Whether it's a shopping center, apartment, church, school, office, factory, hospital, garage—or any size building—new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control problems.

Once equipped with Honeywell Customized Temperature Control, they'll have an ideal indoor "climate"—and save fuel besides.

And with a complete line of pneumatic, electric and electronic controls to choose from, Honeywell Customized Temperature Control offers you the greatest flexibility in design. Then, too, when it comes to performance, Honeywell-built controls assure years of trouble-free operation. And they're backed by the finest service organization in the controls industry.

For full facts on Honeywell Customized Temperature Control, call your local Honeywell office. There are 104 across the nation. Or mail the coupon today.

Willard A. Brown, Rubloff's project managing director, says: "We have a great many different temperature control problems here at Evergreen Plaza. Honeywell handles them all extremely well. Fuel consumption is low, too."

MINNEAPOLIS
Honeywell

H HONEYWELL First in Controls

MINNEAPOLIS-HONEYWELL REGULATOR CO.
Dept. HV-6-122, Minneapolis 8, Minnesota
Gentlemen: I'm interested in learning more about Honeywell Customized Temperature Control.

Name .....

Firm Name .....

Address .....

City ..... *Zone* ... *State* .....

GAS APPLIANCES

(*Continued from page* 127)

and homes, have agreed to adhere to the following terms of their code of ethics:

Product design based on sound engineering principles and proven research, and employment of superior workmanship and materials.

Assignment of accurate and dependable input and output ratings to all products.

Design and construction with a view to satisfactory product performance over a reasonable expected lifetime.

Readiness to cooperate in the preparation and application of official standards, when and if promulgated by the American Standards Association.

Application of highest standards of safety and durability to the selection of controls and accessories used in finished products.

Furnishing of carefully prepared directions, wherever practicable, to assist installers and users.

Leudemann told the conference on industrial and commercial gas that "the seal indicates to customers and regulatory bodies that any equipment on which it is displayed has been manufactured on sound engineering principles by reliable manufacturers of long-standing reputation."

The GAMA code, Leudemann pointed out, further provides that, on presenting their qualifications, manufacturers of industrial gas equipment "shall make only such representations as are consistent with integrity and the highest standards of our industry, and shall scrupulously avoid false or misleading statements with respect to the grade, quality, design, construction, or performance of our products."

ASHVE MEETING

to be held in Denver June 29, 30-July 1, 1953; four technical sessions, 14 papers are scheduled.

The American Society of Heating and Ventilating Engineers will hold its 1953 semi-annual meeting in Denver, June 29, 30-July 1, at the Shirley-Savoy Hotel. Fourteen papers will be presented at four technical sessions devoted to determination of heat and moisture transfer through building materials, cooling tower performance, heat pump design and performance, effect of relative humidity on heat losses of individuals in various temperatures, and heat exchanges in floor panel heated rooms and heat flow analysis in panel heating and cooling sections.

The Society's Rocky Mountain Chapter will act as hosts for the meeting and the committee on arrangements will be under the direction of Fred Janssen. E. A. Thompson is vice-chairman of the committee on arrangements and B. H. Spurlock, Jr., honorary chairman.

• **EVENTS.**—In addition to the technical sessions, other special features will include the traditional golf tournament, the semi-annual banquet and the scenic wonders of Denver.

Advance reservation requests indicate a record attendance at the semi-annual meeting. Denver, the capital of Colorado, is easy to reach from all directions, and by all means of transportation—six airlines, seven railroads and six major highways. Members from most of the states and Canada are expected to attend the interesting technical sessions.

Registration will commence on Sunday, June 28, at 10 a.m. and will be from 9 a.m. each day throughout the meeting. The ASHVE Council will meet on Saturday, June 27, and the Chapters Conference Committee Meeting will be held on Sunday, June 28. The Committee on Research has meetings scheduled for both June 27 and 28. A welcome luncheon will take place at noon on Monday, June 29. As a fitting climax to the three days of ASHVE activities, the semi-annual banquet will be held at 7 p.m. on Wednesday, July 1, 1953.

• **TECHNICAL.**—The program of technical sessions is as follows:

MONDAY, JUNE 29

9:30 A.M.—First Technical Session
- Performance of a Forced Draft Cooling Tower, by B. H. Spurlock, Jr.
- Effect of Relative Humidity on Heat Loss of Men Exposed to Environments of 80, 76, and 72F, by T. Inouye, F. K. Hicks, S. E. Telser and R. W. Keeton
- Experimental approaches to the Study of Noise and Noise Transmission in Water Piping Systems, by W. L. Rogers

TUESDAY, JUNE 30

9:30 A.M.—Second Technical Session
- Electrical Analogger Application to the Heat Pump Process, by C. F. Kayan
- Design and Performance of a Residential Earth Heat Pump, by Merl Baker
- Moisture Movement in Soils Due to Temperature Difference, by W. A. Hadley and R. Eisenstadt

WEDNESDAY, JULY 1

9:00 A.M.—Third Technical Session
- Design Data for Slat-Type Sun Shades for Use in Load Estimating, by G. V. Parmelee and D. J. Vild
- Automatic Permeance Testing by the Permeometer, by F. A. Joy and A. W. Sherdon
- Thermal Performance of Frame Walls, Part II—Air Spaces Blocked at Mid-Height, by G. O. Handegord and N. B. Hutcheon
- *Development of Thermal Conductivity Probe, by F. C. Hooper and S. C. Chang

1:30 P.M.—Fourth Technical Session
- Performance of Warm Air Perimeter-Loop and Radial Systems in a Residence, by H. T. Gilkey, R. W. Roose, and M. E. Childs
- Heat Exchanges in a Floor Panel Heated Room, by L. F. Schutrum, C. M. Humphreys, and G. V. Parmelee
- Further Studies of Thermal Characteristics of Plaster Panels, by L. F. Schutrum and C. M. Humphreys
- *Heat Flow Analysis in Panel Heating or Cooling Sections—Case II: Floor Slab on Earth with Uniformerly Spaced Pipes at the Slab-Earth Interface, by H. B. Nottage, C. V. Franks and L. E. Hulbert

*Presentation by title.

ASRE SPRING MEETING

to be held at Lake Placid Club, Lake Placid, N. Y., June 28 to July 1

Three technical sessions and two conferences have been arranged for the spring meeting of the American Society of Refrigerating Engineers which is to be held at the Lake

(*Continued on page* 132)

SERVEL gives you the SURE answer-

for AIR CONDITIONING commercial buildings, OLD and NEW—LARGE and SMALL

Servel 25-ton Water Chiller with no moving parts, operates continuously at peak capacity with minimum maintenance. Simple controls will modulate capacity as much as 50%, with corresponding economy.

adaptable! The Servel 25-ton absorption-type Water Chiller, because of its light floor loading and quiet, vibrationless operation, can be installed in a penthouse, on individual floors or in the basement . . . *without special foundations or floor braces.*

economical! Used with individual-room chilled water coils, this Servel system needs no expensive duct work—only simple piping. Consequently, installation is much easier—and when remodeling, costs are less.

Steam, from your most economical source, operates the unit. Even waste heat may be used. High operating efficiency is further assurance of low costs. And maintenance is minimized because there are *no moving parts* to wear or grow noisy—factory-guaranteed for five full years.

easy control! The Servel system is remarkably flexible! Individual floors or selected areas can be air-conditioned as you choose. Zone control is easily possible with separate units placed where desired, or from a central source.

Let your Servel dealer tell you more about Servel Water Chillers for *Air Conditioning, Process Cooling* and *Industrial Precooling* . . . or mail the coupon for information and engineering co-operation. No obligation.

Servel

the name to watch for great advances in

AIR CONDITIONING ✓ REFRIGERATION

MAIL NOW FOR COMPLETE DETAILS!

SERVEL, INC., Dept. HV-6, Evansville 20, Indiana

Please send me complete information on Servel equipment for ☐ Air Conditioning ☐ Process Cooling ☐ Industrial Precooling

Name_____

Firm_____

Address_____

City_____ County_____ State_____

ASRE SPRING MEETING

(*Continued from page* 130)

Placid Club, Lake Placid, N. Y., from June 28 to July 1. The following technical papers will be presented:

- **MONDAY MORNING**— Cooling Tower Selection Chart and Its Application to Field Tests of Cooling Towers, by A. M. Norris, Baltimore Aircoil Company, Inc.

Year-Round Reflective Radiant Conditioning, by Dr. C. A. Mills, University of Cincinnati.

Technical Considerations Affecting Air Force Air Conditioning Requirements, by W. T. Smith, U. S. Air Force.

Air Cooling Coil Performance, by D. D. Wile, Refrigeration Engineering, Inc.

Domestic Refrigerator Conference will run concurrently with this technical session.

- **TUESDAY MORNING**— Unique Compressor Design, by A. A. McCormack, McCormack Engineering.

The Effects of Internal Roughness on the Pressure Drop and Heat Transfer Characteristics of Integral Finned Tubes by V. R. S. Arni and J. E. Myers, Purdue University.

Superheat—Cause and Effect, by L. Buehler, Creamery Package Manufacturing Company.

Heat Transfer Film Coefficients for Refrigerants Boiling Inside Tubes, by Prof. Merl Baker, University of Kentucky.

Residential Air Conditioning Conference will run concurrently with this technical session.

- **WEDNESDAY MORNING**—Sound and Vibration Control, by R. L. Miller, Anemostat Corp.

Selection of Capillary Tubes for Household Refrigerators and Freezer Chests, by J. R. Prosek, International Harvester Company.

A Study of Corrosion Resistant Finishes for Air Conditioning Equipment, by P. O. Blackmore, Interchemical Corporation.

Metastable Flow of Freon-12, by Prof. P. F. Pasqua, University of Tennessee.

AUTOMATIC COAL FIRING

for heating equipment is subject of BCR meeting as producers and retailers look over devices.

Coal producers, retailers, and coal researchers from 12 states met Wednesday, May 6, in Columbus, Ohio, to evaluate the status of coal-fired automatic residential heating equipment and to consider ways to increase coal markets through the sale of such equipment.

Eighty of the country's leading coal producers and retailers attended the meeting sponsored jointly by Bituminous Coal Research, Inc., the American Retail Coal Association, and the Product Promotion Committee of the National Coal Association. It was the first joint undertaking of these groups. Lennox Furnace Company, a prominent manufacturer of coal furnaces, provided meeting facilities at their plant.

- **DISPLAY.**—E. R. Kaiser, assistant director of research, and J. R. Garvey, supervising engineer, both of Bituminous Coal Research, Inc., displayed and discussed 20 pieces of residential heating equipment. These units included overfeed, underfeed, bin feed, and hopper types of coal burning equipment. Ways of removing ash manually and by automatic devices were shown. Burners and furnaces competitive to coal were also exhibited and discussed.

Coal men inspect BCR-developed crop dryer.

Kaiser and Garvey revealed manufacturing costs, sales markups, and installation costs for each of the units. It was possible for those in attendance to compare figures that had not been revealed so fully before this meeting.

In addition to units commercially available, David Campbell, a coal retailer of Indianapolis, Indiana, displayed his automatic stoker with electric ignition. The electric ignition permits the fire to go out when there is no sustained heat demand. Fire is automatically rekindled when the thermostat again calls for heat.

BCR developed for the conference a low-cost underfeed stoker to demonstrate what was felt to be the extreme lower limit to which costs could be brought on such a unit. This "BCR Basic Stoker" also had an electric ignition device.

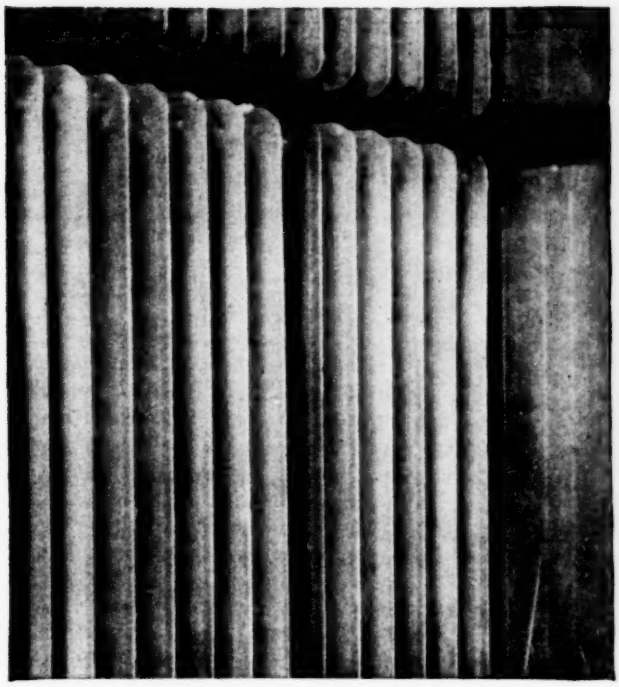
- **CROP DRYER.**—A coal-burning crop dryer, developed by Bituminous Coal Research, Inc., was displayed at the meeting. This unit, being introduced in a test marketing program in 17 counties in central Ohio, promises to increase the market for domestic stoker coal by 12 to 15 tons annually for each unit sold. The retail price of the crop dryer is $1,895. This makes it competitive with other dryers now on the market.

Producers and retailers during the afternoon session discussed how the stoker coal market could be regained by more intensive effort through the sale of stokers. The session was led by Raymond Salvati, president of Island Creek Coal Company and Robert Bidlack, president of the American Retail Coal Association.

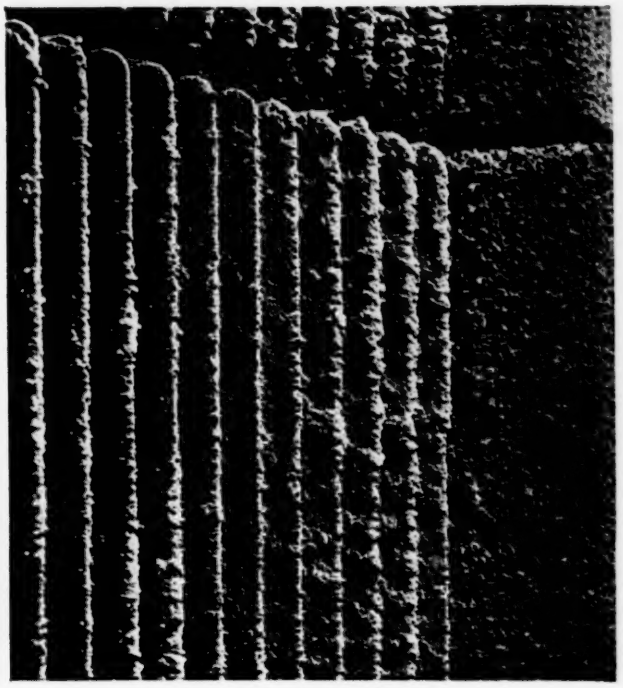
- **PROMOTION.**—The suggestions are being taken under advisement by the Product Promotion Committee of National Coal Association. The Committee is working with the American Retail Coal Association to revitalize this coal market.

Julian E. Tobey, president of Appalachian Coals, Inc.,

(*Continued on page* 146)



Before—PRECIPITRON® cells in close-up show clean aluminum collector plates. This is the way they appear after periodic washings, which dispose of all trapped airborne particles.



After only 2½ weeks cleaning "normal atmospheric" air, the same plates had accumulated this much dirt. PRECIPITRON stops airborne dirt, pollen, mists—even germs and smoke!

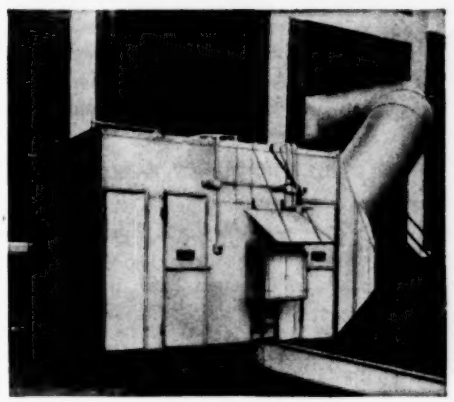
ELECTRONIC BARRIER

AGAINST INVISIBLE DIRT

Airborne particles are costly everywhere. For example, corrosive specks can mar the finished surface of finely machined parts. Contamination is dangerous in laboratories and food processing plants. In textile mills, airborne specks streak the yarns. In processes, buildings, offices—even in homes—"invisible" dirt costs you money.

But PRECIPITRON—the electronic air cleaner—will take *all* the dirt out of the air. It removes particles so tiny they can be seen only with an Ultra Microscope. The savings in controlling airborne dirt with PRECIPITRON are worth looking into today.

To help you *put air to work*—with air cleaning, air conditioning or air handling—Westinghouse offers a complete equipment line. For a free copy of General Catalog 600, call your local Westinghouse-Sturtevant Office. Or, write to Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Mass.



Cleaning efficiency of PRECIPITRON is 90% or better at 333 fpm. Dirt is held on the plates until washed down. A garden-type hose flushes it directly into the drain—quickly, easily, inexpensively.

YOU CAN BE SURE...IF IT'S Westinghouse

AIR CLEANING

J-80227B

Experience is my Classroom

By T. W. REYNOLDS

• DRUMMING-UP TRADE

A heating dealer piles up a lot of 50 gal oil drums in front of a home in which he has installed a well known make of oil furnace. The empty drums are theoretically filled to represent a saving to this home owner of around 1,100 gal of oil or a fuel bill of 40% reduction.

I am all for this visual means of demonstrating savings and believe that the modern efficient furnace or heating plant can, in many cases, show an improvement of 50% in fuel savings. However, I am curious to know whether the home in question is insulated, and if not, how many drums would be piled up in front of an adjacent identical house when insulated. Would the fuel saving, percentage wise, then remain the same. In other words, does the efficiency of a device remain the same regardless of how efficient or inefficient allied devices and environment become. I would also like to add as many drums to the pile to represent the savings each salesman claimed were possible with his devices.

I could think of fuel savings made in various other ways. For example, a saving due to shortened time element in heating up, as well as in comfort that is obtained sooner. The last mentioned, however, may be partly offset by the greater amount of heating apt to be done. In other words, the owner pays for more comfort. Generally speaking, it does seem as if both dealer and manufacturer have neglected some possible items which could make things even more favorable for the use of their items.

• VARIABLES OF THE PIPING TAX

There was a time when the matter of piping tax was a fairly well known percentage. Piping tax is a term that covers the amount heat loss through piping expressed as a percentage of the heat load on the boiler. But the one time standardized old fashioned steam and water heating system with conditions more or less fixed is no more. Today's piping tax, if and when determined, will have to be on a sliding basis to more closely approximate the present and future varied conditions of design and appliances.

As a whole, the heating industry is not entirely in agreement with the amount of piping tax allowance, especially as to the reduction to be made as the size of installation increases. True, it is common practice to fix the piping tax as 25% of the net boiler load, but this is only for the average house heating system with average conditions and insulated piping, even then (although not always) it serves more as a maximum than as a minimum percentage.

Heating systems now have pipes which (according to the designer or size and type of system) may (1) be of large size and usually insulated to varying extent and quality, or (2) of small size and left entirely bare. A system may be only one pipe, or it may be a two-pipe upfeed or downfeed with supply pipes insulated (including or not including the fittings) and with return pipes insulated or left bare. Piping may be sized very large to provide for future extensions, insulation may deteriorate or disappear with time, and bright copper pipes may ultimately tarnish to lose more heat when bare.

Heat losses of piping will also vary with method and arrangement of grouping and banking and whether horizontal or vertical runs. Such variations generally affect the piping tax allowance to an appreciable degree because they usually occur mainly with the larger sizes of pipe. Furthermore the piping, here again in large sizes, may be confined or in hot spaces, such as over boilers, along breechings, in pipe tunnels, at ceiling, in monitors, or at process equipment.

Again the pipes may be run in cold and/or drafty places at the floor or along doors and windows open or closed, or in passage ways, stair wells, cold air chambers, and pipe tunnels, or other spaces strongly ventilated. Risers may also be exposed to air motion in the walls. In any event, all piping run in cold and drafty locations is most additive to the piping tax allowance, especially where the pipes are bare or poorly insulated.

There may be numerous branch runs to many small radiators or convectors of low heat output, or relatively few to large radiators of high heat output, such as wall type radiators. Again the piping may consist of a single central main with but short branches to unit heaters.

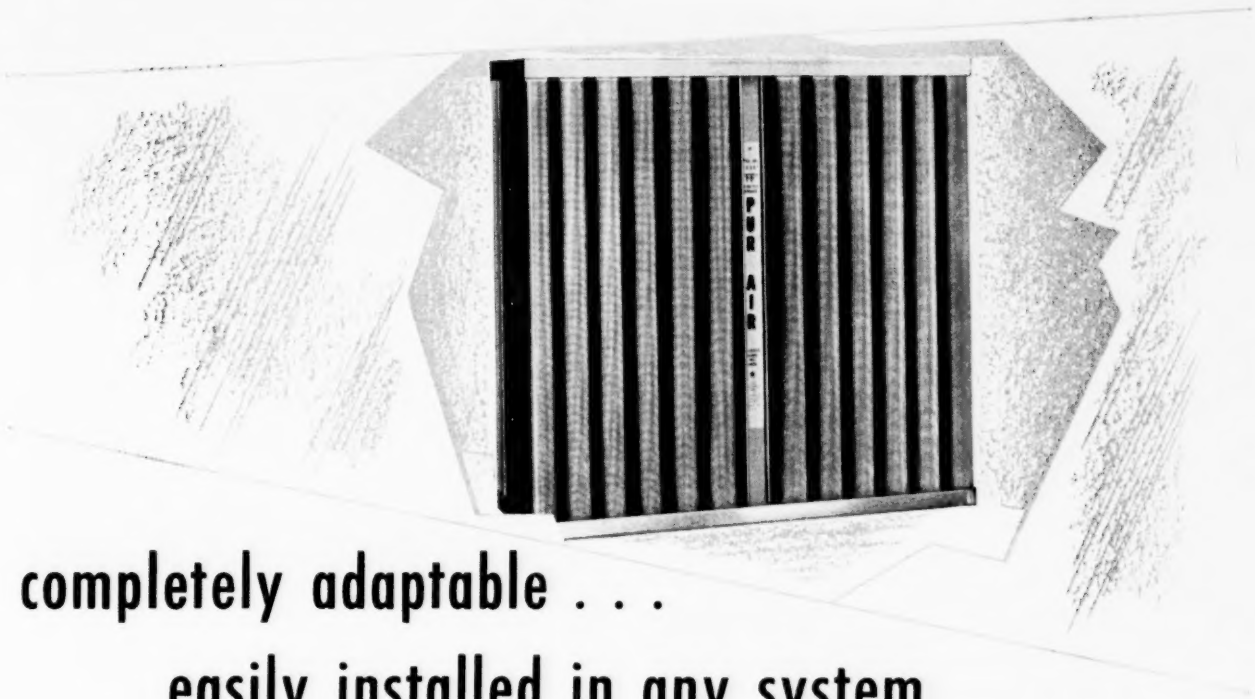
The piping tax for forced hot water may be materially less than for a gravity hot water. This is particularly true with one-pipe water systems, especially where these have small mains, even though these are entirely bare. Finally, it should be remembered that currently used piping tax allowances may not be correct for use with boiler replacement in old systems.

Just what allowances should be made for each variable presented is generally unknown, but some allowance should be made to the best of one's judgment and experience. It is a fact that few recognize there are so many variables. In very large installations some of the variables cited tend to cancel out, although there are some installations where size only tends to aggravate some condition. We should know more about the proportion of the piping tax due to the return piping. This information is necessary to a proper evaluation of the piping tax due to the lower temperature of the return and the fact that it is usually left bare.

There are still other factors affecting piping tax, for example insulation thickness. Insulation of a few ply is used when the system is generally operated at low tem-

(*Continued on page* 136)

Remove Odors with *Pur Air* Adsorbers



completely adaptable . . .

easily installed in any system

Using the proved principle of the gas mask, adsorption by activated carbon, Pur Air equipment will positively remove odors. A faint smell of violets or a deadly concentration of chlorpicrin gas . . . either is absorbed and retained by Pur Air activated, coconut-shell carbon.

The Pur Air Filter-Fold unit above can be used singly or in combination to fit the system. Accordian-like construction provides maximum adsorbing surface. Since the amount of carbon determines effective life, it is important to know this unit contains 44 lbs. of guaranteed 50-minute, activated, coconut-shell carbon. Tests of over 15,000 materials proved that to be the best for odor and gas adsorption.

Wherever you encounter an odor problem, you can profit by the help of a Pur Air engineer. Call him in without obligation. Seventy sales offices are at your service.

Pur Air, self-contained odor-removal units

Shown at left are several Pur Air units that are ready to plug in and start removing odors. There are sizes for any enclosed area . . . small lavatories, large warehouses, taverns, restaurants, hospital rooms, kennels, homes, offices, and a hundred others. Give us an idea as to the size area with the odor problem and we'll give you data about the Pur Air unit to correct it.

Pur Air DIVISION
BARNEBEY-CHENEY *Company*

MANUFACTURERS OF ACTIVATED CARBONS

N. Cassady and Eighth Aves., Columbus 19, Ohio

SOLVENT RECOVERY DIVISION: Complete Solvent Recovery Systems

(*Continued from page* 134)

perature, or only occasionally used, as with the intermittent heating of churches. Such application of insulation is economical in first cost and also in operation, but it does increase the piping tax at peak load when higher temperatures of the heating medium are used.

The fact that the piping tax, a percentage of the net boiler load is expressed in terms of equivalent direct radiation is sometimes forgotten. One square foot of equivalent direct radiation equals 240 Btu for steam and 150 Btu for water. Hence, the measured surface of piping is not the surface which comprises the percentage for piping tax. For example, a heating system may be operated at 1 psig (215F) or 5 psig (227F) with return under vacuum at 20, 15 or 10 inches of mercury and with temperature differentials across the traps of 0, 5, 10, 25 or even 30F. Thus, one square foot of actual or measured return pipe surface at temperature of trap discharge will emit from 179 to 267 Btu when bare, or from 60 to 89 Btu with normal insulation, or at temperature of the average vacuum maintained in time and for its entire length. It may vary from 135 to 193 Btu bare, or from 44 to 64 Btu insulated.

The heat loss of the return may even be less than just given because its heat-losing surface is often so great as to lower the temperature of the condensate to where there is insufficient heat to furnish the latent heat of vaporization. Thus, any one who has used thermometers to indicate or record return line temperatures at various points will have noticed that the temperatures do not at times conform to the corresponding pressures of steam tables.

So it should be remembered that supply and return pipes vary in heat loss with time, installation, type of system, and operating conditions. Therefore, a piping system may have an actual piping surface which is 25% of currently rated installed radiator surface, yet have considerably more or less percentage in terms of equivalent direct radiation. Another thought which seems pertinent to this discussion is that the more we refine the components of boiler load, the more it is necessary to allow some factor of safety in our calculations for field conditions. Once a boiler is installed, it has left the care of the laboratory and seldom is operated with the same care, draft, fuel and cleanliness.

• DOING IT ELECTRICALLY

In some cases it is not practical to heat a space from a central system and in others, heat may be desired at hours when the central system is not operating. Here is where the electric unit heater becomes particularly suitable. It is easy to spot anywhere and to supplement the central system, which capacity may be limited. Drainage problems are avoided, since there are no pipes to grade. Lift fittings, steam traps, dirt pockets and valves are not required.

L. J. Wing Mfg. Co., Linden, N. J. has an electric unit heater in three types. They are useful for garages, loading docks, pump houses, crane cabs, watchmen's shanties and local spot heating. There is also one made by Edwin L. Wiegand Co., Pittsburgh, Pa. for floor, wall or ceiling mounting that weighs but 79 lb in the 20 kw model.

Edwin L. Wiegand Co. also make an electric cable for melting snow. It provides a heat intensity of 40 watts per square foot. A recent sidewalk installation was made at the John T. Ryan Memorial Laboratory of Mine Safety Appliances Co., Pittsburgh, Pa. United States Rubber Co., New York, has produced an electric radiant heat panel $\frac{1}{16}$ inch thick for cementing to the ceiling like wallpaper. Although it can be used for an entire house, it is especially convenient as a supplement to the existing system when a den, garage or new room in the attic is added. Paley Mfg. Co., Brooklyn, N. Y. has an electrical convection heater for recessing or placing against the wall.

Electric Range Co., San Francisco, Calif., markets a Wesix electric strip circulator to prevent condensation on window surfaces, wet rot and peeling of paint on sills and window frames. In the housing project at the Grand Coulee Dam, electrical resistors or heating coils, thermostatically controlled, are placed in an insulated concrete pit below the floor. A blower circulates air through the coils and stones which fill the pit to supply warm air to floor registers. Return registers are in the baseboards. The stones heat in off-peak periods of electric power, although much less space is required where water is substituted for stones. In one case, electrically heated water tanks were used.

Even static electricity has been used to good purpose in a washable plastic filter made by Goodyear Tire & Rubber Co., Akron, Ohio. The filter becomes electrically charged by the passage of air through it to attract dust particles.

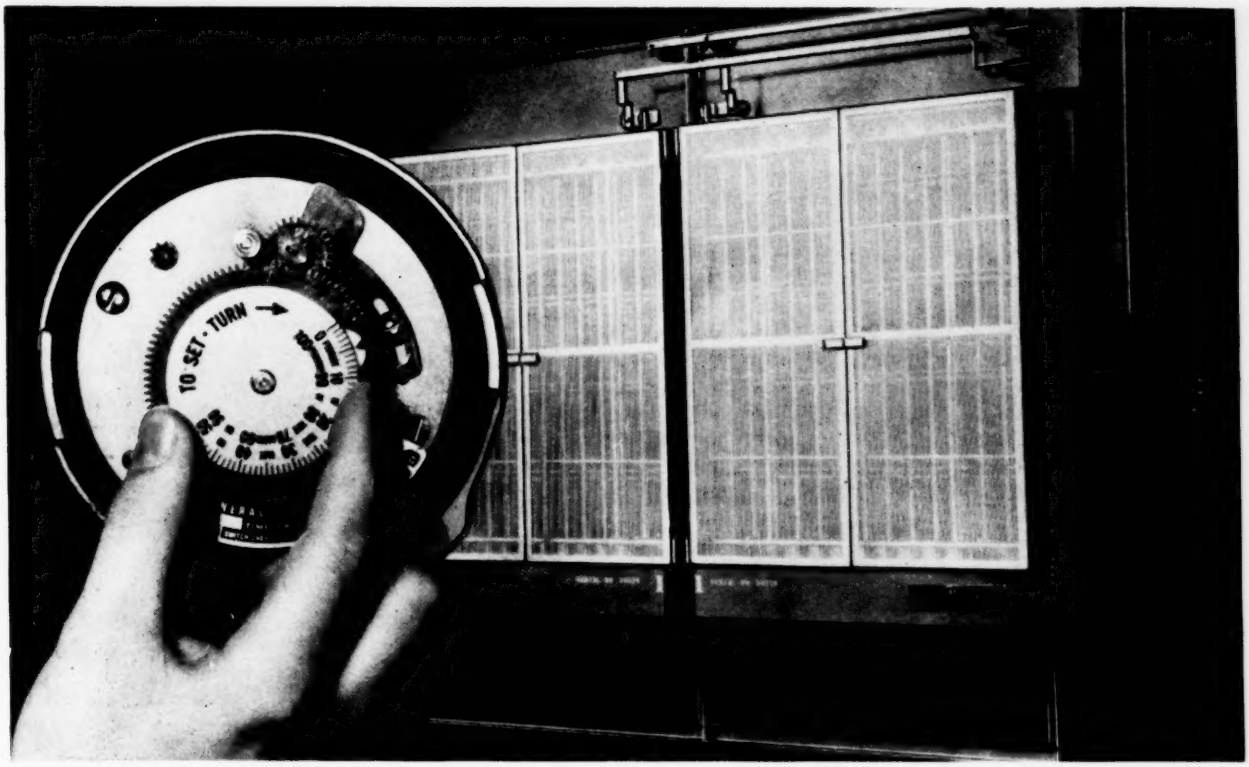
• RANDOM THOUGHTS ON INSULATING

Insulation for buildings, pipes and equipment is a much discussed form of savings. Generally, some insulation is needed, but how much, what type and the thickness are matters that should be carefully weighed. Most engineers have some sort of table or chart tucked away which will show the most economical thickness to use in each case. Unfortunately, the chart relates to a fixed economy, whereas labor, material to insulate and fuel costs are higher. This is something to think about. Should the need for more and thicker insulation in existing industries be reviewed, especially as the life and efficiency of existing insulation is always on the wane?

On the other hand, Smith or Brown has greatly expanded his plant output as the years have passed and this without any increase in boiler plant capacity or the piping system. Therefore, the thermal loss of any particular pipe line in his plant has decreased per ton of product. As long as he thinks in terms of relativity, he has less need for insulation. Then again, as output and boiler load increased, he no doubt went to a cheaper grade of fuel and devised ways of burning it more efficiently. Obviously, he does not need insulation quite as thick as in some plant less favored.

Mildness of climate, type of building construction, size of glass area, and operating time, all enter into the problem, often for insulation of both buildings and pipes. A pipe occasionally used may need but little if any insulation. On the other hand, the pipe may be of such size that the intermittent but frequent warming-up load and thermal loss could be greatly decreased by insulation. Should a new plant have piping covered with a high grade of thick insulation because of contemplated increase in pressure or temperature five or ten years away? The time for this increase may prove to be 20 years away; by that time the

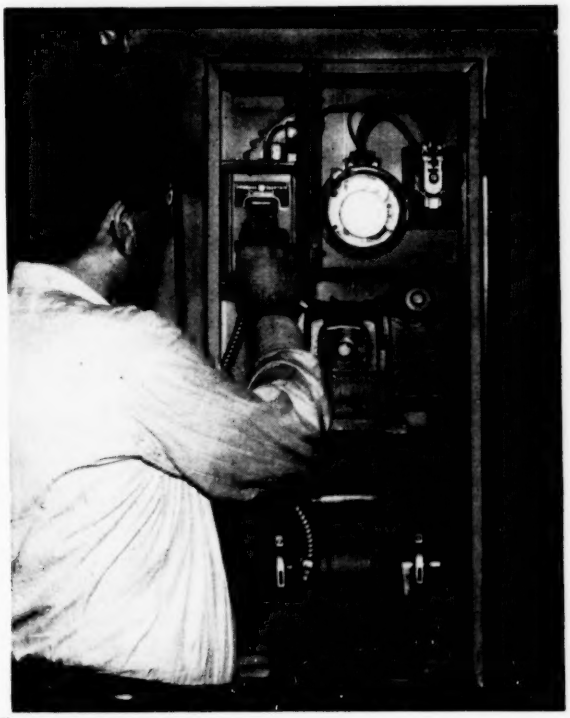
(*Continued on page* 138)



GENERAL ELECTRIC PROCESS TIMER CONTROLS THE CYCLE OF PLATE MOVEMENT IN THIS AAF AUTOMATIC ELECTRONIC PRECIPITATOR.

This G-E Process Timer Has Given One Firm

25 YEARS OF DEPENDABLE ON-OFF CONTROL



COST REDUCTIONS can be improved by TSA-14 accuracy and dependability—on repeat-cycle process control jobs.

Twenty-five years ago General Electric engineers were asked to solve a repeat-process timing problem for the American Air Filter Company. That same year (1928) the TSA-14 process timer was completed. AAF standardized on the timer and has been using it in quantity ever since.

HERE'S HOW IT'S USED

Inside the air filtration units parallel plates collect foreign matter by electronic precipitation. The plates move every twelve minutes—the cycle being controlled by the TSA-14 timer—to make a complete rotation of all plates every 24 hours. Precise control means a smooth-running unit—and customer satisfaction.

RUGGED CONSTRUCTION

A weatherproof, die-cast base and glass cover permits this timer to be installed outdoors as well as indoors. Installation and adjustment are easy. Maintenance costs are negligible. It's ideal for heating and ventilating repeat-cycle processes.

FOR MORE INFORMATION

Contact your nearest G-E Apparatus Sales Office—or write for Bulletin GEC-525 (on the TSA-14). Address Section 603-152, General Electric Company, Schenectady 5, New York.

You can put your confidence in—

GENERAL ELECTRIC

(*Continued from page* 136)

insulation life has decreased. I know of such a case where it would have been cheaper to have provided the best in the beginning, because insulation was then bought much cheaper.

Jones says he does not need to insulate some particular line because the condensate from that line is run to the sewer. He does not care how cold the condensate gets. However, he does not see that additional condensate will be wasted because of no insulation and that a corresponding cold water make-up will be required with all the accompanying evils of boiler strain, entrained air, and corrosion unless the boiler water is adequately treated. Probably, no other line needs insulation as much as that line. Then, too, it may be found that the condensate could after all be economically returned to the boiler, or else used for heat transfer at some near point in the plant.

These are all pertinent factors to consider when purchasing insulation. While the purchaser should properly weigh all of the factors, particularly as to the need of the second and third inch of insulation, as a general rule he need not hesitate as to the necessity for the first inch. That first inch is the greatest saver.

• WELL WATER FOR RADIANT HEATING AND COOLING

A correspondent writes that in Melbourne, Florida he is building a house of 600 sq ft area. He has available a constant supply of well water with a sulphur content at a temperature of 70F. This water would be run continuously through the hollow tile floor in a cement base of the structure to heat in winter and cool in summer. If necessary, additional heat would be provided by a radiant screen or other type heater. He asks whether the proposed method is practical and would moisture accumulate on the floor.

Weather in Florida is a variable from gulf to ocean and from North to South. It can get quite cold (freezing temperatures) in the interior, well away from the water, even as it can at times in the Melbourne area. Duration of cold weather is from one to three days, and then only during early morning and evening hours if the sun shines and the wind does not blow. Modern Florida houses, with innumerable loose fitting jalousies, infiltrate cold air freely. There is actually 390 linear feet of crack of living room glass in my Florida home.

Sun warms the floor and often provides sufficient radiant heat indoors even though the indoor air may be only at 60F when the outdoor air is at 50F. At other times there will be a dampness, uncomfortable to the year-around resident, and so Florida homes costing $15,000 or more are now more frequently built with heating systems.

Florida weather data are meager but it is known that the temperature of an unheated cement floor surface in the given location will be about 65F in winter and no higher than 80F in summer, provided the floor is shaded by hurricane awnings and venetian blinds. Cold or cool outdoor weather affects the interior ground temperature in Florida but little, because the coolness does not last long and the sun hours are many.

With water at a temperature of 70F year-around, the temperature of the ground and the cement floor surface should be about 70F in winter and 75F in summer. By psychrometric chart we find it will condense moisture out of the air in the summer at air temperatures of 90F and 60% relative humidity or 85F and 70% relative humidity. However, the usual Florida house (jalousies, etc.) has sufficient air movement to prevent cooling to the dew point and depositing any noticeable moisture even though rubber floor coverings may unglue, particularly in closed houses. Humidities in Florida are high when the sun is not out.

In the proposed method of heating, water at a year-round temperature of 70F would prevent expansion and contraction stresses within the tile floor and hence the floor should be tight enough. Not much space cooling and still less of heating would be obtained, but from the standpoint of comfort at the floor, the cement floor in winter at 70F should be a bit more comfortable for a material which conducts heat rapidly from the usual bare feet customary to Florida. However, floors such as terrazo are hard on the feet, shod or not. So rugs are often used and this lessens the heating and cooling value of a floor at a temperature of only 70F to 75F.

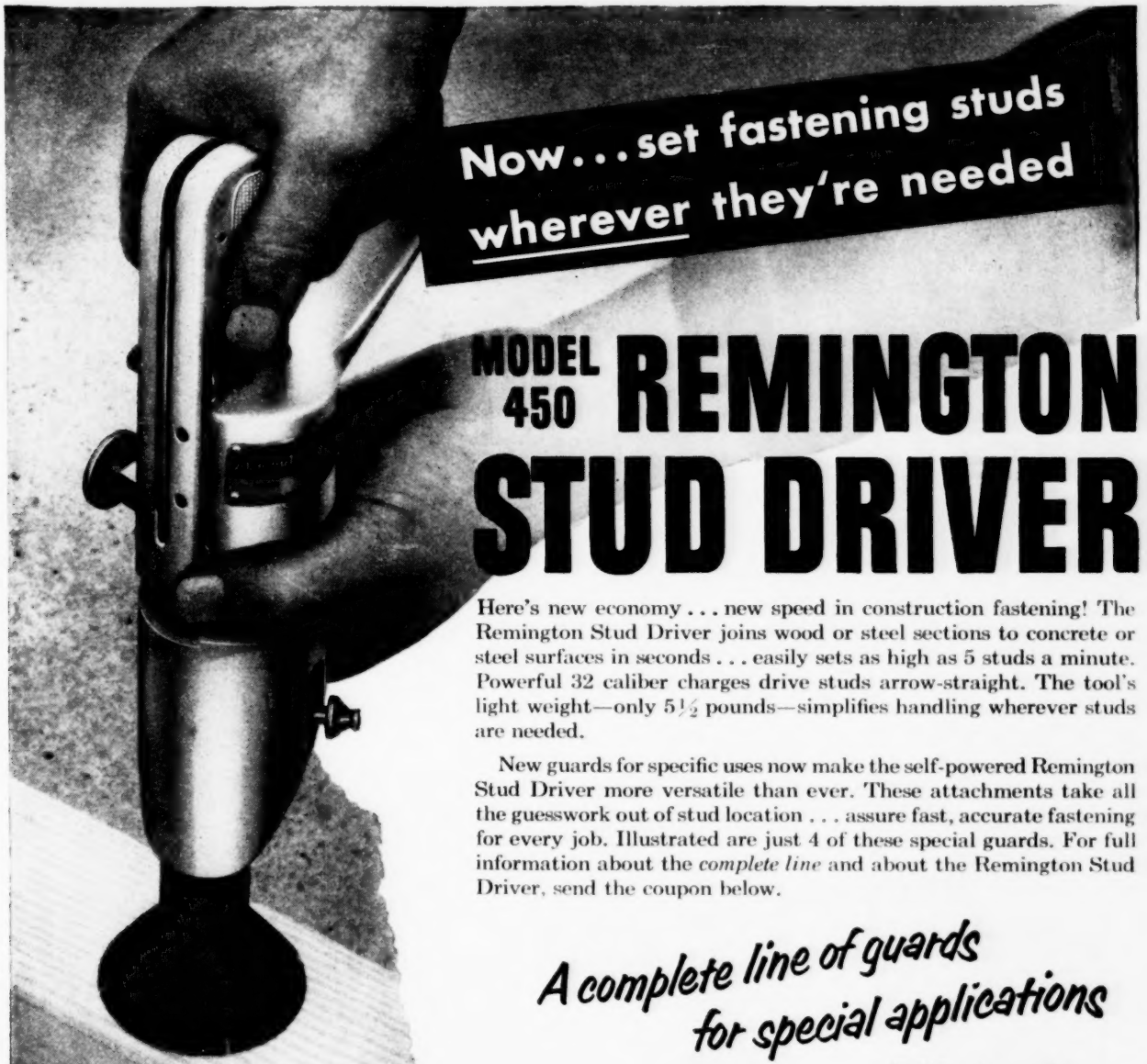
As to the cost of operation, this should be negligible, and initial expenditure should be nil as one already has a pump and well. Well water should be discharged to a distributing basin for graduated gravity flow to equalize throughout the tile grid floor. Movement of water need be slow due to large contained water volume. Water could waste to lawn and garden or pool.

Occupants of the less costly homes in Florida find it more comfortable outdoors when the sun is shining, and generally living is more outdoors in Florida. Some turn on the gas or electric range for a few hours in cool weather, together with the electric bath room heater and sometimes a small electrical heater in the living room. One party I know with damp unplastered concrete block walls uses a dehumidifier.

The electrical radiant glass unit is also being introduced in quite a few homes although local power companies do not welcome the infrequent peak electrical heating load. So a few small heaters burning oil or bottled gas are often used. Oil heaters create less odor than gas heaters and this kind of odor seems to annoy tropical vermin. However, use of oil heaters requires more re-decorating. Gas and oil odors are less in homes with jalousies, but regardless of what heat is used, heating is becoming more of a requirement in Florida.

Considering the brief period that heating becomes necessary, the initial expenditure for a regular heating system may appear as rather high. Therefore, there is a tendency to heat with electricity. This increases the operating cost, but the overall or seasonal heating cost is small due to limited use.

As for cooling requirements, a second story, a slight elevation of the ground or ocean location will obtain a breeze of sufficient cooling, but such locations are relatively few. The more costly homes now built are generally provided with cooling or year-round air conditioning. In connection with the old attitude of "bear with the discomfort the short time it is around," it is interesting to note that only recently in the West Palm Beach jail, a policeman on temporary duty shivered all night. Complaining of this in the morning, his relief asked him why he did not turn on the radiator heat alongside of him. He had not realized that such conveniences were available in a Florida jail.



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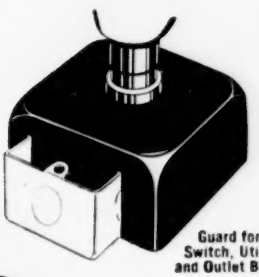
New guards for specific uses now make the self-powered Remington Stud Driver more versatile than ever. These attachments take all the guesswork out of stud location . . . assure fast, accurate fastening for every job. Illustrated are just 4 of these special guards. For full information about the *complete line* and about the Remington Stud Driver, send the coupon below.

A complete line of guards for special applications



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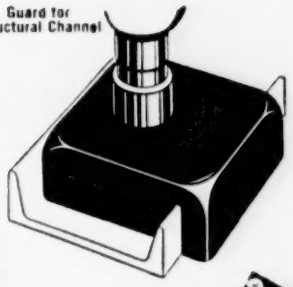
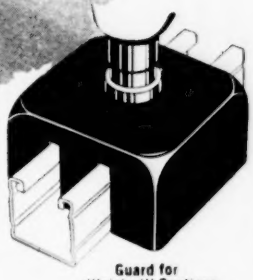


Guard for Structural Channel



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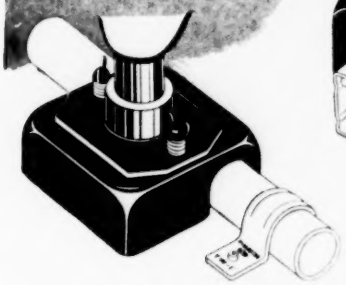

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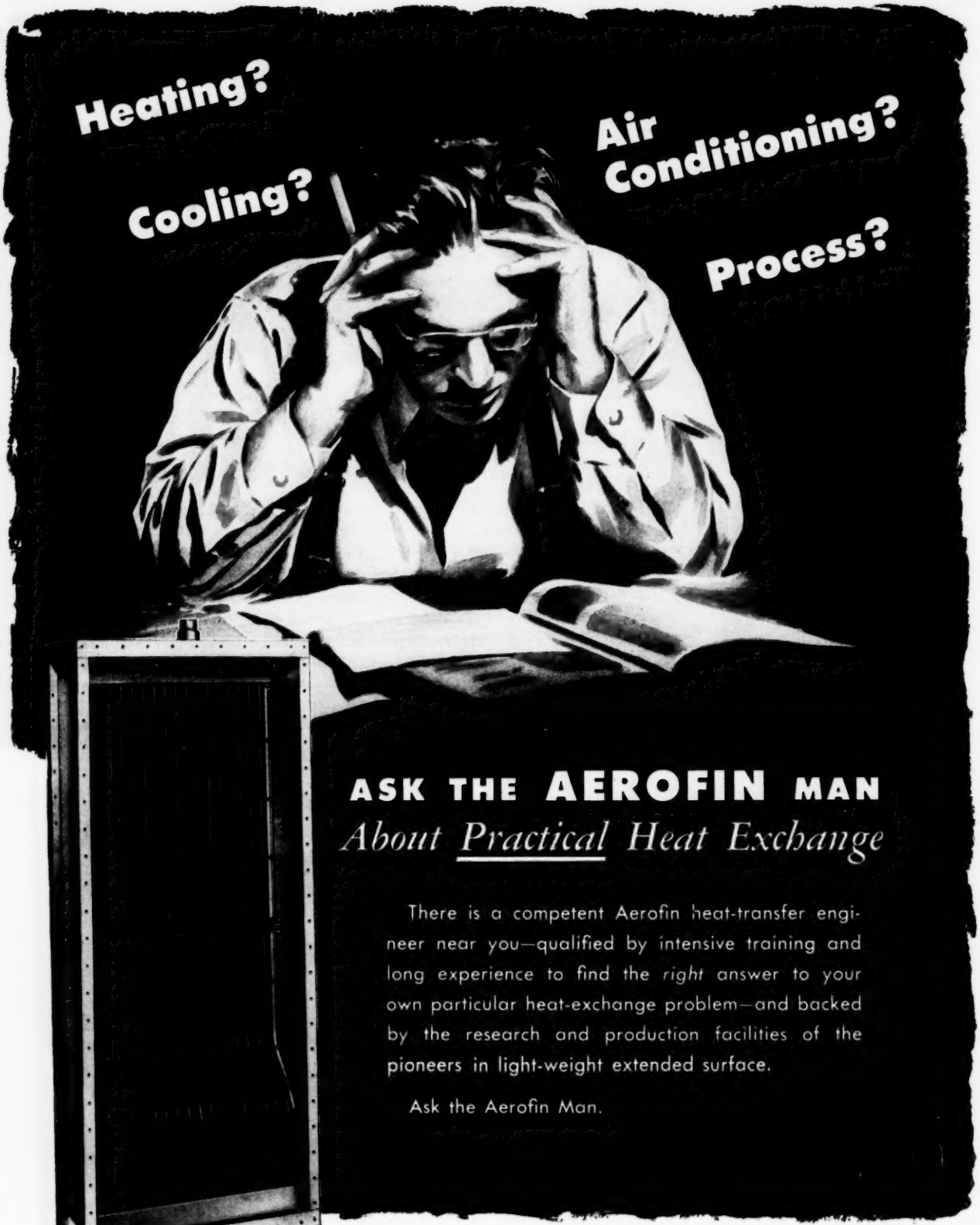

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- **News of Equipment and Materials**
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Circle the item Numbers in which you are interested and print clearly your name and address with title.

NEW CATALOGS

UNIT AIR CONDITIONERS

Publication of its new Bulletin 522-C, covering in eight pages its line of unit air conditioners in 3, 5, and 7½ ton capacities, is announced by Frick Co., Waynesboro, Pa. Many illustrations show typical installations of these units, and a labeled, interior view diagram shows the construction of a unit air conditioner. Cooling, adaptability, and installation advantages are described, as are method of installation and operation. A section on controls and a table of specifications and dimensions are included. . . **Item 69**

STEAM, HOT WATER HEATING

Entitled A, B, C of Modern Heating, a 10-page booklet, Form H-10, is distributed by Fedders-Quigan Corp., Buffalo, N. Y. Intended for home owners and planners, the booklet gives, laymen's language, the advantages and economies of steam and hot water heat, featuring the company's convectors and baseboard radiation. Diagrams and illustrations aid in explaining principles of operation and component features. . . . . **Item 70**

GAS BOILER CATALOG

Catalog No. 607, describing and illustrating the company's new Series 66 gas boilers for building heating in the larger residential, institutional, commercial, and industrial applications, is distributed by The National Radiator Co., Johnstown, Pa. The new six-page catalog shows the automatic controls furnished with these cast iron boilers; presents drawings of control systems for both hot water and steam installations; and contains tables covering boiler horsepower and input and output ratings for natural, mixed, manufactured and LP gases. Other information contained in the catalog includes roughing-in measurements and dimensional data on tappings, flue openings, and chimney sizes. . . . . **Item 71**

PUMPS AND COMPRESSORS

A six-page catalog No. 546 which briefly describes its line of air and gas compressors, aftercoolers, valves and centrifugal pumps for boiler feeding, general power plant and industrial applications, is issued by Pennsylvania Pump & Compressor Co., Easton, Pa. . . **Item 72**

DEHUMIDIFIERS

A specification sheet covering its industrial packaged dehumidifying units is available from Dryomatic Corp., Alexandria, Va. Described in the bulletin are Model 100, for spaces up to 25,000 cu. ft., Model 25CT, to 10,000 cu. ft., and Model 20, to 7,500 cu. ft. . . . . **Item 73**

MAKE-UP AIR PROBLEM

A four page bulletin entitled Balanced Industrial Ventilation, is issued by National Association of Fan Manufacturers, Inc., Detroit, Mich. The scope of the bulletin is limited to the problems resulting from the relationship of exhaust and make-up air systems, and the bearings this has on the heating load. . . . **Item 74**

V-BELT CATALOG

A new fractional horsepower V-belt catalog for use in servicing light duty applications is announced by Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N. J. In this catalog, belts are listed according to the new industry-standard numbering system. Various type machines are listed together alphabetically by company or trade names for determining the proper belt. . . . . **Item 75**

POCKET MANUAL ON HEATING

The 273-page Pocket Manual on Heating, designed to replace catalog HB514, is announced by C. A. Dunham Co., Chicago, Ill. The manual is intended to be of use to operating engineers, steam fitters, and maintenance men. It contains information on the application, installation, and maintenance of wet heating system equipment. . . . . **Item 76**

PERIMETER DIFFUSERS

Its 1953 perimeter diffuser catalog has been issued by Titus Incorporated, Waterloo, Iowa. This 8-page bulletin gives complete descriptions together with capacity, dimensional and other data of the company's three models of perimeter diffusers and includes brief information on the company's door, partition, return air and sidewall grilles as well as featuring the company's sales promotion kit for selling diffusers. . . . . **Item 77**

CONVERSION OIL BURNER

Literature featuring its 251 Series conversion oil burner is announced by Thatcher Furnace Co., Garwood, N. J. This folder points out the features of the burner such as: All aluminum housing which is impervious to rust; stainless steel igniters; vaned-end cone and the fuel pump with a built-in cut-off valve which assures instantaneous shut-off to eliminate after-drip. A cutaway view of this burner shows the integral parts which make up this unit. . . . . **Item 78**

INDUSTRIAL HEATER CATALOG

Catalog 1510, a 32-page catalog giving the complete story on standard and heavy-duty centrifugal fan industrial heaters, is issued by Westinghouse Electric Corp., Boston, Mass. Standard industrial heaters are used to heat large areas where conventional heating equipment is inadequate. Heavy-duty industrial heaters are suited for large manufacturing industries. They are used with high-pressure steam systems and have a wrought iron construction. Information on where to use the heaters, at what circulating capacities and temperatures, and how to place them is given in an application section. Another section explains automatic temperature control and tells how to estimate the heat load a particular heater must carry. A set of typical specifications is given and typical examples are worked out. Tables and graphs of performance data are given as well as outline dimensions of the units. Other sections cover construction features, accessories, and instructions for installation. . . . . **Item 79**

Postage Will be paid by Addressee

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FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

HEATING AND VENTILATING
148 LAFAYETTE STREET
NEW YORK 13, N. Y.

READERS' SERVICE DEPT.

TEMPERATURE REGULATORS

Its line of self-operating temperature regulators for steam, liquids, and gases is described in Bulletin No. ST162 which is now being issued by Farris Stacon Corp., Palisades Park, N. J. A cross-section diagram is labeled and described to show the principles of operation and the important parts and features of a temperature regulator. Typical uses, such as on hot water heaters, are presented, and specifications and selection charts are given. .....**Item 80**

FURNACE FITTINGS CATALOG

Catalog No. 53, covering its line of Jenkins furnace fittings, is available from Ralph Mfg. Co., Inc., Wadsworth, Ohio. The 20-page booklet is divided into five parts, a gravity section, a section of draft diverters and chimney caps, a metal chimneys section, a forced warm air section, and a section on galvanized and aluminum sheets. Drawings, specifications, and list prices are included for each item described, and a folding diagram shows two forced warm air systems. ..**Item 81**

AIR-COOLED HEAT EXCHANGERS

A 12-page, illustrated bulletin, FF-FD-0.001, on air-cooled heat exchangers for a wide variety of industrial cooling and condensing applications is issued by The Fluor Corp., Los Angeles, Calif. Known as Fin-Fan Heat Exchangers, the units described are of the forced draft type and are designed to cool liquids or gases at pressures up to 5,000 psi and temperatures up to 1,500 F. .....**Item 82**

MOTOR-GENERATOR REFERENCE BOOK

Its new Motor and Generator Reference Book, 51R7933, designed to assist in the selection of motive power to handle most industrial applications, is made available by Allis-Chalmers Mfg. Co., Milwaukee, Wis. The 50-page pamphlet is reprinted from the 1952 edition of Lincoln's Industrial-Commercial Electrical Reference published by the Electrical Modernization Bureau, Inc., White Plains, N. Y. Text and illustrations on integral horsepower motors and generators are included in the book. .....**Item 83**

RIGID PLASTIC PIPE

The publication of a new 4-page illustrated booklet, Carlon L Rigid Plastic Pipe, is announced by Carlon Products Corp., Cleveland, Ohio. Discussed in the new publication are various applications for which this pipe is recommended. These include cross-country piping, lawn sprinkler systems, land drainage, and processing and exhaust lines handling highly corrosive liquids, gases or vapors. Natural gas, oil, and various petroleum derivatives are among substances which can be handled by this pipe. Detailed information is presented on how sections of the pipe are joined, and how they are connected to metal fixtures or established metallic pipe lines. Dimensional drawings and descriptions are included of the plastic fittings made for use with the pipe. Covered in detail is the new compression coupling which is developed to provide added flexibility. Specifications are listed for standard and extra heavy pipe. ....**Item 84**

AIR HANDLING UNITS

A two color, 20-page catalog covering its line of air handling units, is issued by Bush Mfg. Co., West Hartford, Conn. The new catalog contains complete specifications on central station air handling units and all accessory equipment, and presents information regarding unit selection as well as rating tables for direct expansion, water, and steam coils. .**Item 85**

BULLETIN ON RADIANT HEATING

Bulletin A-109, explaining the operation of its radiant ceiling which heats or cools radiantly and has acoustical control, is now available from Architectural Products Div., Burgess-Manning Co., Chicago, Ill. The bulletin, entitled A Story of Radiant Heating and Radiant Cooling illustrates the construction of the ceiling, explains the principles of radiant heating or cooling, and gives practical application of radiant energy heating to human comfort conditioning. .....**Item 86**

COOLING TOWER BOOKLET

Bulletin 47-B, a 4-page bulletin describing the company's recently introduced line of Type 3-B Series of mechanical draft cooling towers, is issued by Water Cooling Div., Binks Mfg. Co., Chicago, Ill. The bulletin contains complete performance data and specifications on the three following types of cooling towers: Single Blower, capacity range, 1 to 36 tons of refrigeration; Twin Blowers, 38 to 72 tons; and Triple Blowers, 88 to 108 tons. Applications such as for use with air conditioning machinery and related equipment in hospitals, private homes, hotels, and apartment buildings, are described, and recommendations for installation capacities are given. .....**Item 87**

UNIT HEATER AIR CLEANER

The Clean-Core air cleaner assembly, consisting of a die-formed filter frame with standard size cleanable type air filters which can be installed quickly on existing or new Young Type SH unit heaters, is described in a Catalog 2552, issued by Young Radiator Co., Racine, Wis. .....**Item 88**

SUSPENDED SPACE HEATERS

Bulletin No. 543, illustrating a new line of suspended space heaters for use with any type of gas fuel, is published by Dravo Corp., Heating Dept., Pittsburgh, Pa. The 6-page folder gives complete specification data with dimensions and capacities of both propeller fan and blower type units. Available output capacities of these heaters range from 70,000 to 178,000 Btu per hour. Full explanations show how they can be used in commercial and industrial applications for heating, ventilating, and process drying, with or without ductwork. .**Item 89**

COOLING DESIGN MANUAL

A new cooling desing manual for estimating and designing residential cooling installations is issued by L. J. Mueller Furnace Co., Milwaukee, Wis. The new new Climatrol manual provides a simple, logical method of cooling design for residential work without using complicated formula. The manual has been written for use by dealers, builders, architects, or anyone concerned with the laying out of residential cooling systems, and it is designed to compare as closely as possible with the accepted method of calculating heat loss, except that it is based on heat gain. In the manual, there is a step-by-step design procedure. An explanation of each of the considerations for the steps in the procedure, and also the necessary tables for register, duct, and equipment size, are contained in the manual. .....**Item 90**

HIGH VELOCITY DIFFUSERS

Bulletin HV Manual 48, with engineering data on the selection, layout and installation of units for high velocity air conditioning systems, is issued by Anemostat Corp., New York, N. Y. It contains data that will help consulting engineers design high velocity air conditioning systems. With these data plus standard tables, engineers can convert low velocity designs to high velocity. Useful tips on duct design, sizing of ducts, types of systems and balancing of units and information on how metal and space savings can be achieved are given. Dimension and layout data on all high velocity units are included. ...**Item 91**

CENTRIFUGAL BLOWERS

Catalog B-10, illustrating and describing its new line of centrifugal, is distributed by Hartzell Propeller Fan Co., Piqua, Ohio. Pictures of fans and blowers are included along with descriptions of design and construction features and applications. .....**Item 92**

SUBMERGIBLE PUMP BROCHURE

A new presentation for its Submerga pump is announced by Red Jacket Mfg. Co., Davenport, Iowa. A special cellophane type overlay brochure on the pump, printed in four colors and similar to booklets used by medical authorities to teach anatomy to medical students, is available. As each page of the brochure unfolds, a different section of the pump is revealed until the entire pump has been disassembled for the reader. The brochure, the company points out, shows the precision construction of this pump. The pump is designed to be submerged under water, out of sight, in either deep or shallow wells. Pump distributors and dealers are invited to write in on their company letterhead for this most interesting brochure.

PLEASE SEND US MORE INFORMATION. Circle below item numbers on which you wish further information.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
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91	92								

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This card is void after Sept. 1, 1953

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TO A FAMOUS LINE

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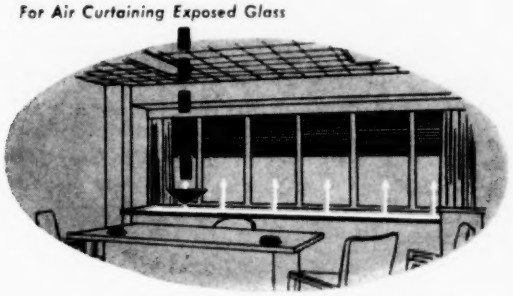
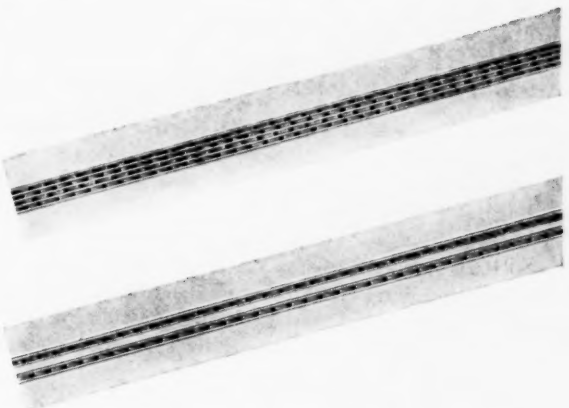
STRIPLINE

DIFFUSERS

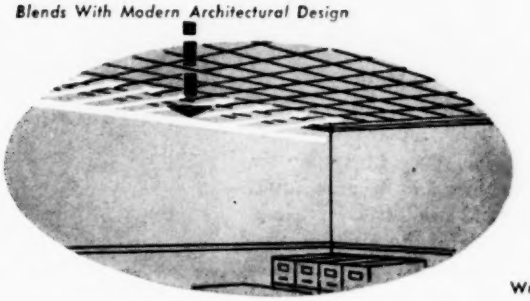
Another AGITAIR first! STRIPLINE . . . the trim, slender, continuous air diffuser with exclusive built-in diffusing vanes which create maximum mixing and aspiration . . . quick temperature equalization and uniform draftless air distribution over any desired length. Supplied as a continuous decorative unit, or in sections to meet any requirements of interior design or air flow.

For Air Curtaining Exposed Glass





Blends With Modern Architectural Design



Write for Bulletin S-100

AIR DEVICES INC.

17 East 42nd St. • New York 17, N. Y.

AIR DIFFUSERS • AIR FILTERS • EXHAUSTERS

PRODUCT APPLICATIONS

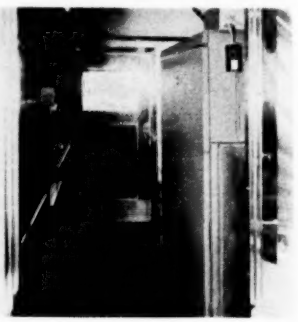
New, Unusual, or Ingenious Uses of Equipment and Materials

Conducted by WM. B. FOXHALL, Associate Editor

Diner Installs Heat Pump

PROBLEM: Bill's Diner in North Canton, Ohio, was constructed to be operated entirely by electricity. Provision for heating and cooling the diner had to be made with close attention to limitations of available space.

SOLUTION: A General Electric 5 hp heat pump was installed by Refrigeration Distributing Company of Canton. The unit is located in a small, out of the way, service corner of the diner. Short ducts bring cool or warm air into the dining section. The heat pump is an air to air unit with automatic switchover from heating to cooling as conditions demand.



RESULTS: The diner is believed to be America's first all electric diner, since cooking is also done by electricity. Compactness, convenience and dual function of the unit makes it attractive for small stores and similar places of business with the result that about 35% of installations of the GE heat pump have been in commercial establishments with the remainder going into homes.

Central Systems Cool Aluminum Buildings

PROBLEM: The nation's first two aluminum sheathed office buildings both require central air conditioning systems. The first such building is the new 30-story Alcoa Building in Pittsburgh and the second, the 99 Park Avenue Building, is now under construction in New York. The 99 Park Avenue Building, a 26-story office building, is the first aluminum sheathed building to be erected for general business occupancy by an investment builder, Tishman Realty & Construction Company. Both require special consideration for air conditioning.

SOLUTION: At the New York Building, part of the air conditioning system will be two Worthington 665-ton centrifugal refrigeration machines and auxiliaries to supply chilled water to Worthington air conditioning units for temperature control of all the interior zones. The system also will supply chilled water for a number of smaller fan units located in the peripheral zone. Compressors will be driven by Worthington's steam turbines supplied with steam by the New York Steam Co. The Alcoa Building is also conditioned by Worthington centrifugal units.

RESULTS: The 99 Park Avenue Building will contain approximately 403,500 square feet of net rentable office space above the first floor. Space will be completely and automatically air conditioned.

Motel Installs Room Coolers in Wall

PROBLEM: The motel Chase Manor on Route 40 in Edgewood, Maryland, is a rambling one-story building with 33 suites accommodating 102 guests. Window type air conditioners were ordered for each of 14 suites, but were not to interfere with operation of casement windows in one wing of the establishment.

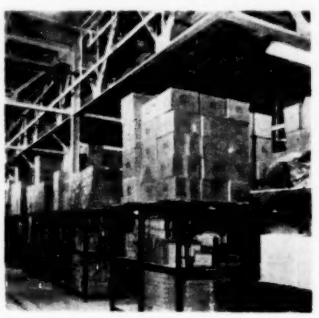
SOLUTION: To accommodate window type coolers with casement window construction, simulated window frames were built into the exterior wall beneath the sill of each casement window. These frames were sized so that U. S. Air Conditioning Corp. half-ton units would fit snugly without the use of spacers.

RESULTS: The demand for the air conditioning accommodations during the past season was so great that the 14 cooled suites were always filled. Owner John Kramer plans to complete the installation of cooling units in the rest of the motel suites.

Heaters Warm Parts Depots

PROBLEM: Merchandising spare parts for automotive service garages requires a network of depots distributed around the country to serve as supply points for area dealers. In planning heating systems for buildings of this type, the designer must overcome problems involving large open spaces, the need to keep floor areas clear for storage, and barriers to natural circulation of air imposed by stacked material.

SOLUTION: Typical of the way in which Ford Motor Company solved the problem in seventeen of its Ford Division parts depots is the one in Cleveland, Ohio. The structure houses a storage area of 140,560 square feet with 16,698 square feet of office space in a concrete block and brick building 242 x 649 ft. Design heat loss of the building was calculated at 9,750,000 Btu per hour. The depot uses 9 large Dravo Corp. gas fired Counterflo space heaters having a total capacity of 9,750,000 Btu per hour. One of the units also furnishes heat for a service school class room, cafeteria and garage



(*Continued on page* 144)

A 5-YEAR WARRANTY

CHRYSLER AIRTEMP COMPRESSORS WARRANTED 5 YEARS

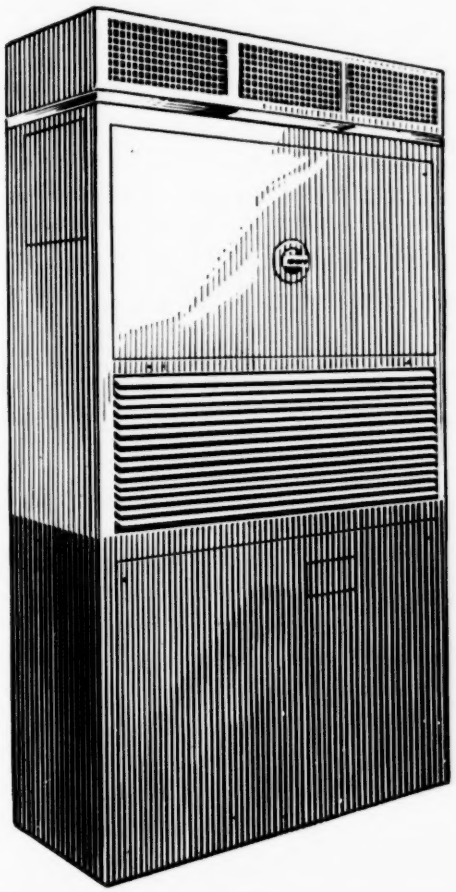
Little more than a year ago, Chrysler Airtemp first offered an optional 5-year warranty on the sealed radial compressor. Performance records of these compressors in the field have proven their value beyond doubt. Now EVERY compressor used in the famous "Packaged" Air Conditioner is warranted five years at no extra cost.

Here are three of the many sound reasons for the amazing performance of these compressors:

1. Wear is reduced through precise machining.
2. Top efficiency at all speeds is assured through radial design.
3. Dirt and moisture are kept out because Chrysler Airtemp compressors are assembled in an air conditioned factory.

Get all the facts today. See why it'll pay you to sell the best in Air Conditioning . . . Chrysler Airtemp "Packaged" Units with the famous radial compressor.

Comfort Zone FOR PROFIT



"Packaged" Air Conditioners
Six models from 2 to 15 H.P. capacity meet every cooling need.

Guaranteed by Good Housekeeping

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AIR CONDITIONING • HEATING
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Airtemp Division, Chrysler Corporation, Dayton 1, Ohio

Airtemp Division, Chrysler Corporation H&V-6-53
P.O. Box 1037, Dayton 1, Ohio

Please send full details on the Chrysler Airtemp Comfort Zone "Packaged" Air Conditioning proposition.

Name _____

Address _____ Phone _____

City _____ Zone ____ State _____

(*Product Applications concluded from page* 142)
and another supplies the shipping office. With the exception of one 2-million Btu heater, which stands on the floor opposite the truck entrance, all heaters are mounted horizontally on the roof girders about 16 feet above floor level. Heaters are separately controlled by individual thermostats.

RESULTS: Flow from each heater travels at sufficient velocity to blanket its zone with heat that penetrates to the floor level regardless of tiered material. This characteristic cut the amount of duct work needed to two short runs, which lowered installation cost considerably. Ventilation requirements of the classroom and cafeteria are met by an arrangement on the heater to bring in fresh outside air. Selection of a small number of high capacity heaters effected a further reduction in installation cost because of less piping, fewer stacks and less wiring.

Air Changes Control Odor Level

PROBLEM: When the luxurious new bar and cocktail lounge in the Atlanta Athletic Club opened recently, air conditioning was installed and the lounge became an Atlanta attraction. It was found, however, that thick carpeting and tweed covered chairs absorbed and held bar and cigarette odors and the air became stale.

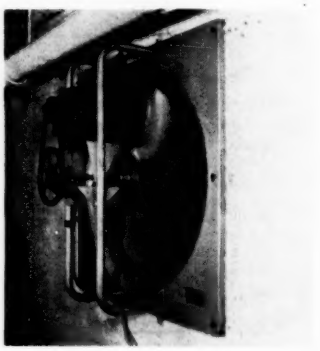
SOLUTION: Engineers for Pur Air Division of The Barnebey-Cheney Co., Columbus, Ohio, recommended changing the air in the 20,000 cubic feet of space every ten minutes. Two A-10 units made by Pur Air were installed.

RESULTS: C. S. Mingledorff, general manager of the club, reports that when the units are operating there is no trace of objectionable odors in the club.

Fan Keeps Bakers Cool

PROBLEM: Heat fatigue in baking rooms can seriously affect bakery production.

SOLUTION: In the bread cooling section of Gottfried Baking Co. in New York City, a special 36 inch exhaust fan, product of Peerless Electric Co., Warren, Ohio, was installed.



RESULTS: The fan operates quietly and efficiently to remove excessive heat and odors. The company reports the installation was completed with little difficulty and production and efficiency have increased.

Waste Heat Produces Smelter Steam

PROBLEM: Plans to recover vital copper in one of the richest undeveloped deposits on the North American continent called for a specially designed boiler to utilize what otherwise would be waste heat from a copper reverberatory furnace. The boiler was to supply steam to a turbogenerator to furnish power for the development of the White Pine Copper smelter 18 miles southwest of Ontonagon, Mich.

SOLUTION: The boiler, which will be about six stories high, is to be in line with and following the reverberatory furnace in which the copper ore is melted. Gases or products of combustion, heavily laden with slag particles and dust, leave the furnace at a rate of approximately 143,000 lb per hour at a temperature of 2600F. The gases first enter the waste heat boiler, then pass through the superheater and convection section of the boiler. Hot, slag particles will fuse on any surface with which they come in contact, especially if the surface is hot. To cope with this problem, the waste heat boiler was designed with tube-to-tube water cooled wall radiation chamber, widely spaced platten-filled chamber and superheater chamber, and a cross-flow convection boiler section. The boiler was designed and is being built by Babcock & Wilcox Co. Heat absorption of the water cooled furnace walls and plattens reduces the temperature of the incoming gases before they enter the superheater. Suspended slag particles are cooled to a dry ash which drops to the furnace hopper from which it is returned to the reverberatory furnace for retreatment to reclaim the copper. Cleaning of the boiler is accomplished by automatic soot blowers which periodically blow high pressure steam through nozzles across the boiler.

RESULTS: Using waste heat instead of fuel for generation of steam recovers about 50% of the heat in the fuel originally supplied to the reverberatory furnace. Cleaning arrangement prevents slag formation on tubes and saves the expense of hand lancing, assuring continuous operation. When the reverberatory furnace is shut down the boiler can be fired with pulverized coal.

Radiant and Warm Air Heat for School

PROBLEM: In two new elementary schools in New Milford, N. J., each a one-story basementless structure with 14 classrooms, provision for both ventilation and adequately warmed floors was to be made.

SOLUTION: Hot water circulating through radiant heating coils made of Spang CW steel pipe, product of the Spang-Chalfant Division of The National Supply Co., maintains a slab temperature up to 55F. Additional heat to supply room temperature and ventilation requirements is furnished by forced warm air.

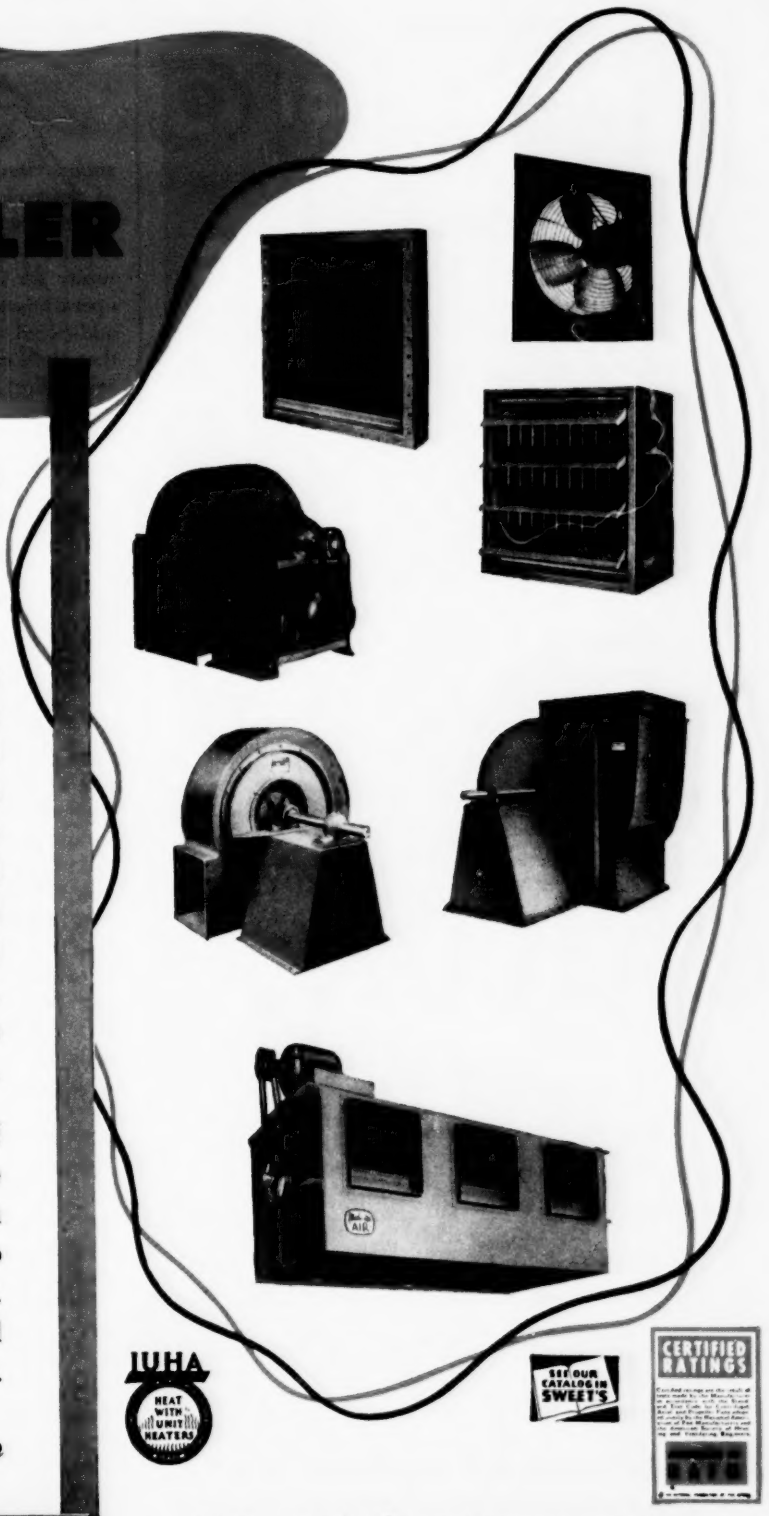
RESULTS: While maintaining the economy of slab floor construction, school architects have accommodated rigid requirements for comfort and ventilation.

nyb PROPELLER FANS

Propeller type ventilating fans deliver large volumes of air at low resistance and low current consumption. All wheels are machine balanced for smooth, vibrationless operation. Made in 2 types and 7 basic sizes to cover a wide range of industrial applications. Pressed steel panels provide rigid support and simplify installation. Totally enclosed motors mounted in heavy welded wire safety guard. Wheel diameters from 12 inch to 48 inch. Direct or belted drive. Capacities from 675 cfm to 23,500 cfm.

Penthouses for roof installation of **nyb** Propeller Fans can be furnished in 7 sizes. Louvers open and close automatically to protect fan against the weather. Separate louvers for wall mounting also available.

Write for Bulletins



IUHA HEAT WITH UNIT HEATERS

SEE OUR CATALOG IN SWEET'S

CERTIFIED RATINGS

All New York Blower Company products are laboratory tested, accurately rated and fully guaranteed in strict accordance with Standard Test Codes.

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FACTORY, LAPORTE, INDIANA

Residential
AIR
CONDITIONING
Without Water!

UNICON
by KRAMER

A Remote Type Air-Cooled Condenser that completely eliminates water, sewerage and plumbing problems.

SPECIFICALLY DESIGNED FOR RESIDENTIAL APPLICATION

Unusually Quiet!

WRITE FOR BULLETIN No. U 250

KRAMER TRENTON CO.
Trenton 5, N.J.

AUTOMATIC COAL FIRING

(*Continued from page* 132)

summarized the joint meeting. He urged a continuation of research and invention on residential-size stokers. He felt that while a number of machines now available are capable of doing a good job, there still exists an opportunity for further reduction in cost and improvement in operation through inventions not yet made. He urged additional conferences of this type, pointing to the fact that such conferences contribute to a concerted industry sales effort.

PIPE LEAK SEAL

developed for Navy uses glass fiber cloth and plastic. Cold process suitable for gas or liquid lines.

The Navy had to work out a method of repairing a broken pipe under emergency conditions without using heat or flame. Out of that pressing need has come a method for making repairs that apparently has inexhaustible industrial applications. Word of the method, which makes use of a special property of a thermosetting resin, has filtered out to industrial engineers and large numbers of inquiries have been coming in, according to a N. Y. Times report by William M. Freeman.

Because the process requires no heat it can be used to seal a leak in a tank holding gasoline, oil or gas while the tank is full. Also, it can be used to protect a transparent glass pipe carrying a dangerous chemical; if the glass should break the protecting jacket will guard workmen in the area.

• **PROCESS.**—A layer of a thermosetting resin of the epoxy group is sprayed on a cloth made of glass fiber and applied to the leak. These resins have the special property of changing into a solid under the influence of an "activator" or in a formulation which requires moderate but not dangerously high heat.

The resins are permanently solid. They cannot be changed back to a liquid by reversing the process. In addition, the patch bonds permanently to itself, so that a mass of the substance applied to a leak can make a patch of greater durability than the original substance.

The technique of patching was developed in cooperation with Navy technical personnel by the Cordo Chemical Corp. of New York and Norwalk, Conn. The story of how it came to be developed and its potentialities was given in an interview by two Cordo executives, H. C. Tate, president, and H. B. Gillespie, director of marketing.

Preliminary testing, going on with forty companies in various fields, indicate the method can be used on lines carrying water, air, steam, gasoline, dry abrasives and many types of chemicals. It can be used on steel, iron, lead, glass, porcelain and plastic.

• **LITTLE SKILL.**—Other uses include protection for lines carrying salt water, flange leaks for coke oven gas, high-octane gasoline under pressure in cement-lined pipe, pinholes in lead tanks, as a caulking material around plates and rivets on large gasoline and oil holders, as an armoring material for pipe carrying dangerous acids, as a sub-

(*Continued on page* 148)

*and naturally they're using

STANDARD'S NEW

Perimeter Floor Register

with Standard's exclusive

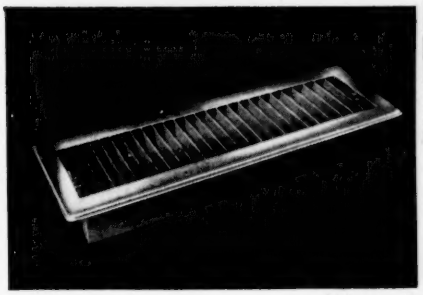
DIALAMATIC CONTROL

*This is it!

Model No. PH-142

Works Better

Made Stronger



SPECIFICATIONS

The face and blades of model PH-142 are fabricated of 16 gauge steel, the blades are set in a fixed-fan angle degree for even deflection. The frame is of one piece, 18 gauge steel construction. The Louvre box fabricated of 16 gauge steel. Packed one to a box, and 20 to a master carton. Comes handsomely finished in gleaming, durable metallic-lustre, 4 sizes available.

For more information and Standard's New Pocket Catalog, attach this coupon to your business letterhead and mail to:

Standard Stamping & Perforating Co.

3129 WEST 49TH PLACE • CHICAGO 32, ILL.

NOW... more heat transfer

from spray deck construction of Binks noise-free Series 3-B Towers

The spray deck construction of Binks new Series 3-B Mechanical Draft Cooling Towers exposes more water surface to the cooling air. The decks also distribute air evenly throughout the tower. This improves heat transfer and makes the entire tower an *active* cooling region. Result: new high standards in cooling performance.

Noted also for their quiet operation and freedom from maintenance, Binks 3-B Towers are ideal for hospitals, hotels, apartment buildings, private homes, commercial establishments, etc. Capacities available range from 3 to 108 tons.

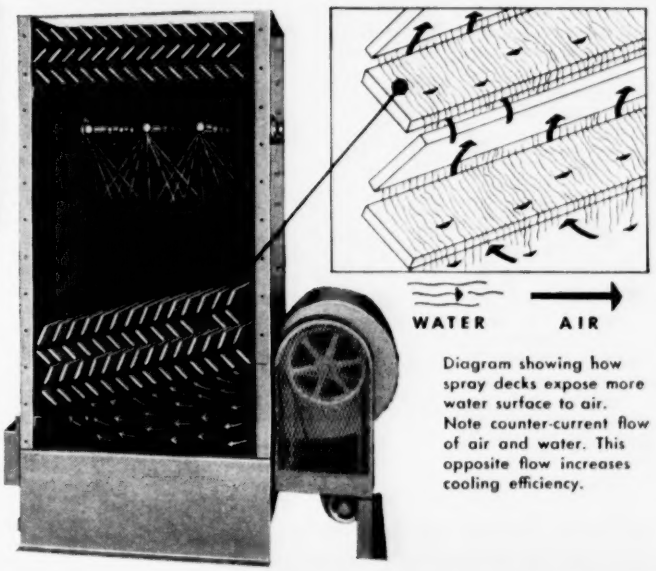


Diagram showing how spray decks expose more water surface to air. Note counter-current flow of air and water. This opposite flow increases cooling efficiency.

Binks

EVERYTHING FOR WATER COOLING

The "inside story"—*FREE*

Send coupon for informative bulletins generously illustrated with pictures and cutaway drawings explaining the operating principles of Binks complete line of natural and mechanical draft cooling towers. Absolutely no obligation.
Binks Manufacturing Company
3120-38 Carroll Ave., Chicago 12, Ill.

A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

REPRESENTATIVES IN ALL PRINCIPAL CITIES • SEE YOUR CLASSIFIED PHONE DIRECTORY

Mail coupon today for your FREE Bulletins

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Gentlemen: Please rush me Bulletins on the following towers:

☐ Natural Draft ☐ Blower-Type ☐ Propeller Fan

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____

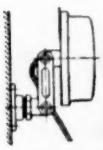
PALMER

mercury actuated Dial Thermometers now in three types to suit any requirements

1

Rigid Stem Dial Thermometer

Rigid stem tapered bulb, interchangeable with standard industrial thermometer separable socket.



2

Wall Mounted Dial Thermometer

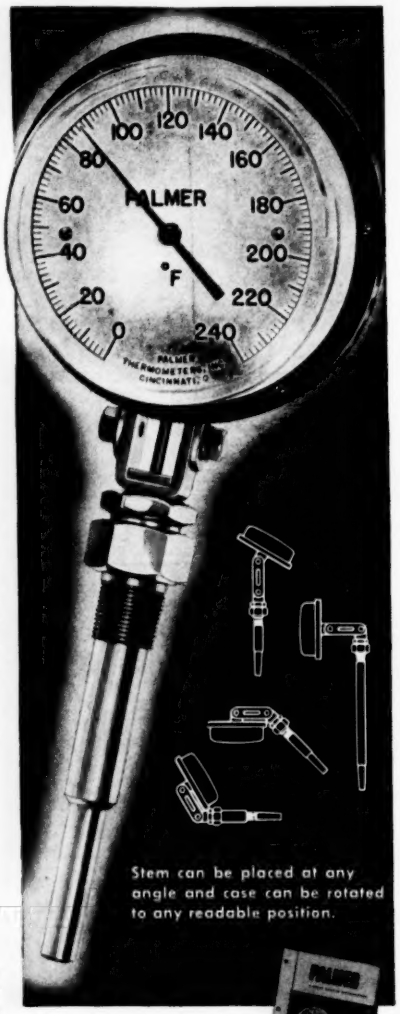
Wall mounted dial thermometer with flexible connecting armor. Case adjustable to easy reading position.

3

Flush Mounted Dial Thermometer

Flush mounted style for panel mounting with flexible connecting armor.

All three types have a full 4½" dial Face



SEND FOR THIS BULLETIN
For details on the New Palmer Dial Thermometer, please write for Palmer Bulletin 51-129.

for accuracy: Mercury actuated . . . Fully Compensated by Invar Compensation. Guaranteed Accurate 1 scale division.

for angularity: Can be adjusted to most readable position at any angle desired.

for readability: Bold Black Numbers . . . 11" of scale Reading Dial face can always be placed in easiest readable position.

for interchangeability: Always specify "PALMER" Separable sockets as they are interchangeable for Dial or Industrial type Thermometers.

PALMER THERMOMETERS, INC.
Mfrs. of Industrial Laboratory Recording and Dial Thermometers
NORWOOD AVE., CINCINNATI 12, O.

PIPE LEAK SEAL

(*Continued from page* 146)

stitute for solder on pipe joints and sections, as a repair material for damaged plastic boat hulls, to join reinforced glass pipe and in the wet lay-up of automobile bodies.

In addition to taking very little time, an important objective of the Navy's original specifications, the method can be put in operation by an operator with little skill.

• **USES.**—Research that has been going on at the Naval Damage Control Training Center in Philadelphia, in cooperation with Cordo, has brought about development of a plastic patch kit very much like a first-aid kit of bandages.

Mr. Gillespie commented, in summing up, that introduction of the method was resulting in new applications being added daily. From the original Navy request for some method of repairing a break quickly, without heat or flame, the process has developed to semi-permanent applications for preventive maintenance programs and the patching of flat surfaces and armoring of others, all in addition to the primary function of emergency repairs.

The Navy in recent weeks has put out a fifty-eight page training manual to instruct personnel in use of the process.

• **TEST.**—A preliminary test of the process by Owens-Corning engineers on an emergency repair of a 20-inch water main in Newark, Ohio, March 21, 1952, was described in H&V for June, 1952.

ARLINGTON TOWERS

largest air conditioned apartment and commercial development to get FHA approval, cost $25 million.

The Federal Housing Administration has given the final green light to a $25 million apartment and commercial development to be located in Arlington County, overlooking the Potomac River and Memorial Bridge.

Construction is expected to begin in 90 days.

• **LARGEST.**—To be known as Arlington Towers, the development is reported to be the largest air-conditioned FHA project of its kind. Plans call for a shopping center, four buildings of eight stories with penthouse and parking facilities for 1,132 automobiles.

Some 3,500 to 4,000 persons are expected to be housed in the 1,679 apartments that range in size from efficiencies to three-bedroom units.

The buildings will be located on an 18-acre site that is part of the old Nevius tract but does not include the section that was sold to the Government some years ago. The 18 acres are bounded by Arlington Ridge Road, Arlington and Wilson Boulevards, and N. Lynn Street.

• **SPONSORS.**—The Arlington Towers project has been in the planning and discussion stage for nearly five years. Sponsors have overcome objections by the National Capital Park and Planning Commission. They obtained a special amendment to an Arlington County zoning ordinance and finally FHA insurance for mortgages totalling $16,714,800.

The sponsor is Arlington Towers Corporation, headed by Walter P. McFarland of Falls Church, who is listed as principal stockholder.

HOW DO YOU CHOOSE BETTER BOILER TUBES?

All boiler tubes are made to the same specifications to do the same jobs, no matter what mill supplies them. In the warehouse, they all look pretty much the same. Surface comparison rarely shows the difference. That is because only *time* can truly test the worthiness of a tube in a boiler—time and the ravages of heat, corrosion and oxidation. Look for the answer down in the basements of apartment houses, or hospitals, or schools, or office buildings, or anywhere else you'd expect to find good boilers, made by fine craftsmen, performing efficient and faithful service over the years. Almost anywhere you look, you'll find the most reliable boilers are equipped with B&W boiler tubes.

Say B&W before you say WELDED BOILER TUBES—for Service-Proved Dependability.

For three-quarters of a century, B&W has been directly concerned with developing and applying boiler tubes for pressures approaching 3000 psi. The application of this extensive knowledge and experience results naturally in the production of superior boiler tubes.

B&W dependability is proved by time and endorsed by hundreds of customers who keep coming back for more . . . B&W WELDED BOILER TUBES.

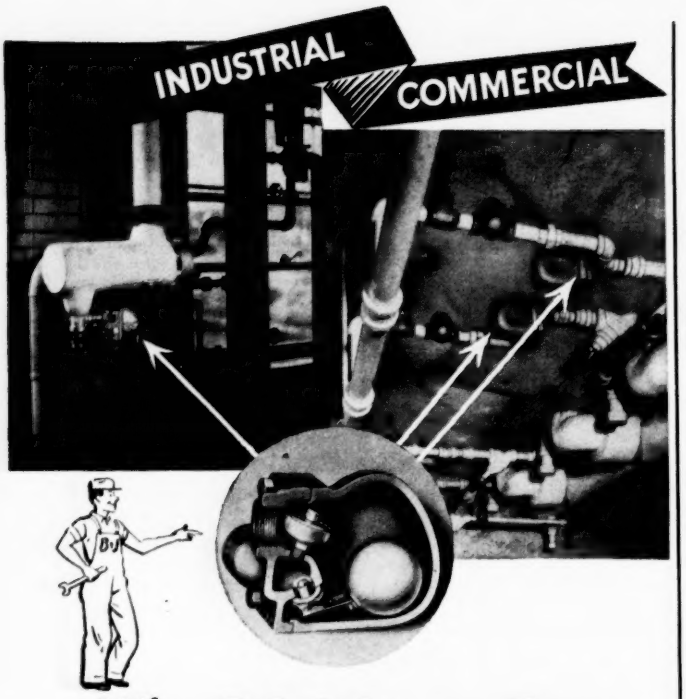
B&W SEAMLESS and WELDED TUBES

THE BABCOCK & WILCOX COMPANY

TUBULAR PRODUCTS DIVISION

Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

TA-1694C

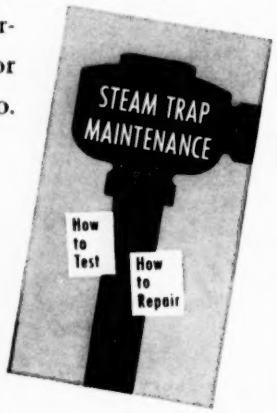


Why B & J Steam Traps are best for the long run

The F & T trap illustrated, for instance, is smaller, fits closer to the ceiling, and the air elimination is accomplished by the famous B & J thermostatic unit. Specially designed for small space installations such as Unit Ventilators.

B & J radiator traps are noted for their long life. Actual service records available. And the same thermostatic unit is available for easy replacement of old elements of practically any make of trap.

The new B & J "Proportionator" Control for vapor systems is worth looking into. Catalog on request.



Ask for the Trap Maintenance Manual, it shows how to test and repair steam traps.

for Quality

B&J Barnes & Jones INCORPORATED

REPRESENTATIVES IN PRINCIPAL CITIES

BOSTON 30, MASSACHUSETTS 7-H

ABSTRACTS AND REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

TRANE AIR CONDITIONING MANUAL

A revised edition of the Trane Air Conditioning Manual is now available. This marks the 16th printing and the second major revision of the book since 1938.

A new fan chapter has been added to cover fan application and selection, basic fan laws, and duct design data and nomenclature.

The book starts with a simplified presentation of the basic physical laws governing heat and cold, and the ones applying to practical problems in air conditioning. There are chapters on comfort and physiology, heat gain and loss, properties of air and the psychrometric chart, refrigeration and calculations for the conditioned air supply. Problems at the end of each chapter show practical applications. A reference section contains standard tables on air, refrigerants, pipe capacities for refrigerant liquid, and vapor, and ducts.

Those who already have this book can purchase separately the chapter on fans.

Trane Air Conditioning Manual. Cloth bound, 8½ x 11 inches, 380 pages. Published by The Trane Co., La Crosse, Wis. Price, $5; chapter on fans, printed separately, $1.

AIR CONSERVATION ENGINEERING

A factual appraisal of the value of purifying air is presented in Air Conservation Engineering by Henry Sleik, vice president, and Dr. Amos Turk, research director, Connors Engineering Corp. This is a reissue of a book first published in 1944.

It outlines air purification in theory and practice, and presents data, tables and charts helpful to the engineer in planning an application and estimating its value.

A section on catalytic combustion covers this method of controlling odors in high concentration and at high temperatures by a process which converts the odorants to moisture and carbon dioxide. Also included are data useful in designing, heating and cooling systems.

Air Conservation Engineering, by H. Sleik and A. Turk. Cloth bound, 8½ x 11 inches, 76 pages. Published by Connor Engineering Corp., Danbury, Conn. Price, $5.

PETROLEUM MEASUREMENT TABLES

Prepared jointly by the American Society for Testing Materials and the Institute of Petroleum, Great Britain, the much awaited ASTM-IP Petroleum Measurement Tables are now published. These tables are standardized on an international basis for the calculation of the quantities of crude petroleum and petroleum products in any of three widely used systems of measurement. The three separate editions which are available are The American, British, and Metric. The tables were developed to meet the

(*Continued on page* 152)

Nicholson Steam Traps

STOP AIR BINDING, Raise temperature 35°

Equipment temperatures were up 30° to 40° higher after Nicholsons replaced mechanical traps in his plant, according to Chief Engineer H.F.D. He also reports faster warm-up, stating that all air-binding was relieved. And "saving in steam waste cut our fuel cost at least 10%". 5 types for process, heat, power. Sizes, ¼" to 2"; press. to 250 lbs. To see why leading plants are increasingly standardizing on Nicholson traps send for . . .

BULLETIN 152

199 Oregon St., Wilkes-Barre, Pa.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

U.S. AIRCO

EVERYTHING IN AIR CONDITIONING

Designers and manufacturers of a complete line of cooling, heating, ventilating and refrigerated air conditioning equipment for jobs you can be proud of

Write Dept. HV 653

Blowers

Individual Room Cooling And Heating Units

Window Units

Evaporative Condensers

Packaged Central Station Air Conditioners

Store Conditioners

Unit Air Conditioners

Gas Unit Heaters

Blower Unit Heaters

Coils

U.S. AIRCO

UNITED STATES AIR CONDITIONING CORP.
MINNEAPOLIS 14, MINNESOTA

The "Inside Story" of

SIEMON Power-Flame SUPERIORITY

Power-Flame units (all models) are shipped completely assembled with controls wired. Just connect power and gas lines.

Quiet, amply-sized blowers provide balanced air mixture for very high heating plant efficiency.

Controls burner mounted and tested. Installation cost reduced to a minimum.

Motors amply-sized and properly applied bring to Siemon users a lifetime of trouble-free service.

Lighting made easy. Push button runner pilot on smaller capacities. Electric ignition on larger models.

STAINLESS STEEL DEFLECTORS provide final blending of fuel mixture — eliminating pulsation.

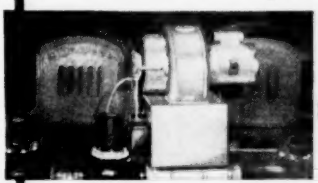
Balanced air adjustment. Precision built to provide metered air for complete combustion.

"Tube within a Tube" design. A Siemon exclusive means quietness and very high efficiency.

The GAS Conversion Burner

Engineered for "Hard to Fire" Applications

Forced-draft design reduces to a minimum the problem of natural drafts. Perfect intermixing of air and gas results in real fuel saving. Highly efficient in down-draft heating plants. Gun-type design permits installation in a minimum of space.



Another example of Power-Flame versatility. This installation made over a coal stoker.

Models in capacities from 85,000 to 3,000,000 B.T.U. input. All units are completely packaged and gun-type design installation costs reduced to a minimum.

You owe it to yourself to get the facts about Siemon's "profit plan." Write today for literature and information about Power-Flame Gas Conversion Burners.

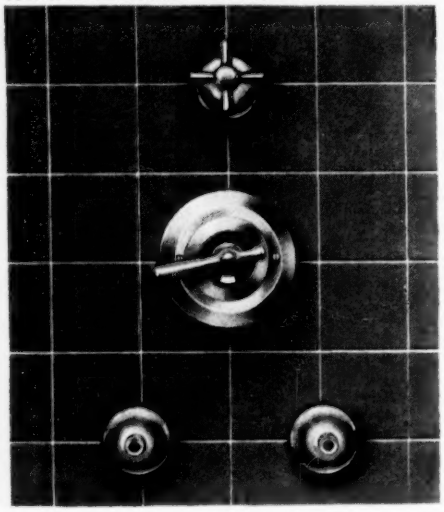
Siemon Power-Flame BURNER

Siemon Manufacturing Co.
1819 Holmes
Kansas City, Missouri

TEST of TIME

Lawler's longer-lasting Quality insures YOUR reputation!

. . . the best insurance YOUR REPUTATION can have! Finished in polished chrome where exposed, the model BC Concealed Thermostatic Shower Mixing Valve has all sliding parts of stainless steel for corrosion proof operation. Actual tests show that the model BC gives highest degree of control . . . BE SURE . . . WITH "BC."



COMPARATIVE CHECK LIST

Compare!

List the facts . . . Check them off . . Lawler comes out first every time! YOUR REPUTATION is protected!

LAWLER "BC" SHOWER MIXING VALVE	Product "A"	Product "B"
Integral Shut Off ✓		✓
Stainless Steel in All Sliding Parts ✓		
Non-Ferrous Thermostats ✓		✓
Positive Hot Non-Scald Shut Off ✓		✓

The Lawler Line Thermostatic Controls

"Performance-Tested" for Longer Life

STEAM TEMPERATURE REGULATORS SHOWER MIXING VALVES WATER CONTROLLERS TEMPERING VALVES

LAWLER AUTOMATIC CONTROLS, INC.

453 North MacQuesten Parkway Mount Vernon, New York

(*Continued from page* 150)

needs of those concerned with purchase, sale, consumption and handling of petroleum and petroleum products.

Included are tables over normal operating ranges for the reduction of gravity and volume to standard temperature, for calculation of weight-volume relationship, and interconversion of a wide variety of commercially useful units.

ASTM has published all tables applicable to the units of measurement used in the United States, while the Institute of Petroleum, Great Britain, has published those applicable to units employed in the British Commonwealth. In addition, IP has published a volume in metric units. Not all of the tables are available in each of the three editions.

ASTM-IP Petroleum Measurement Tables. Cloth bound, 6¾ x 9¾ inches, 525 pages. All editions may be obtained from American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. American Edition, $8.75; British Edition, $7; Metric Edition, $7.70.

BASIC MECHANICS OF FLUIDS

A textbook designed to be covered in the usual three-hour semester course in fluid mechanics has been written by Hunter Rouse, professor of fluid mechanics and director, Iowa Institute of Hydraulic Research, and J. W. Howe, professor and head of the department of mechanics and hydraulics, State University of Iowa. In Basic Mechanics of Fluids, the authors emphasize the useful application of the principles developed. The basic principles of kinematics and dynamics are applied to the elementary motion of a fluid, and the effect of each essential fluid property is studied.

Some of the chapters in this book are fluid statics, fluid kinematics, fluid dynamics, effects of fluid weight, effects of fluid viscosity, resistance to turbulent flow in conduits, resistance to flow past immersed bodies, lift and propulsion, and effects of fluid compressibility. At the end of each chapter is a group of problems to be solved.

Basic Mechanics of Fluids, by H. Rouse and J. W. Howe. Cloth bound. 6 x 9 inches, 245 pages. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $4.50.

• • •

SPECIFICATIONS FOR STEEL PIPING MATERIALS—ASTM Specifications for Steel Piping Materials cover all specifications for carbon steel and alloy steel pipe and tubing as developed through the work of its Committee A-1 on Steel. In the back of this book are emergency alternate provisions applying to sixteen of the specifications. Specifications in this volume cover pipe used to convey liquids, vapors, and gases at normal and elevated temperatures, steel tubes for refinery service, heat exchanger and condenser tubes and boiler and superheater tubes. There are also specifications for materials used in pipe and related installations such as castings, forgings, bolts and nuts. American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. Price, $3.75.

Only ADSCO's exclusive features make maintenance so easy. There's no breaking of pipe connections to inspect or service the trap, because all working parts are mounted on the cover. An extra cover assembly becomes a complete spare trap . . . replace the cover in a matter of minutes, service the original, and the result is a spare trap always ready.

ADSCO traps offer additional exclusive advantages: reversible stainless steel valve and seat double the life of the trap . . . inlet and outlet connections on *both* sides make installation easy and less expensive. Write today for catalog data.

AMERICAN DISTRICT STEAM COMPANY, INC.

NORTH TONAWANDA, NEW YORK

Since 1877

For removing a LARGE VOLUME of Fumes or Air at HIGH VELOCITY

allen

VERTICAL DISCHARGE FAN

Whenever you face the problem of discharging fumes or vapors through a roof ventilator so that they will not short circuit back through building openings, you'll find the solution in this new Vertical Discharge Fan. It is designed especially for industrial applications that require the removal of a large volume at high velocity. The "VD" roof fan is fabricated of zinc-coated iron sheet with welded construction throughout. Automatic wing dampers open with air blast, close weathertight when not operating. The "VD" is available as direct drive with motor mounted inside air stream or as "VDR" with motor mounted outside throat of ventilator. Either type is available in a wide range of capacities and sizes.

Write for catalog on complete line of roof ventilators.

ALLEN ENGINEERED VENTILATION

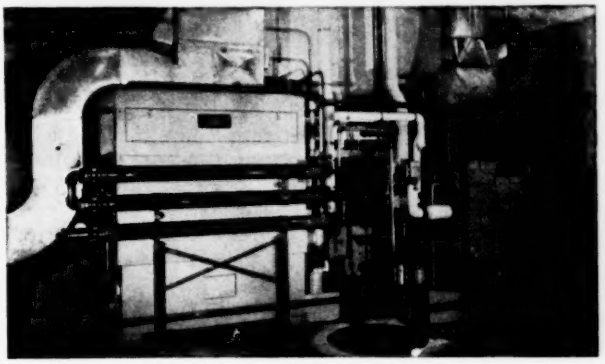
PRODUCTION PLANNING CO.

ROCHESTER, MICHIGAN

Roof Ventilators for Every Commercial and Industrial Need

This NEW METHOD DRIES AIR

PRECISELY AS YOU WANT IT



NIAGARA CONTROLLED HUMIDITY AIR CONDITIONING

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is

Best and most effective because . . . it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

Most reliable because . . . the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

Most flexible because . . . you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Easiest to take care of because . . . the apparatus is simple, parts are accessible, controls are trustworthy.

Most compact, taking less space for installation.

Inexpensive to operate because . . . no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

The cleanest because . . . no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.

For complete information write

NIAGARA BLOWER COMPANY

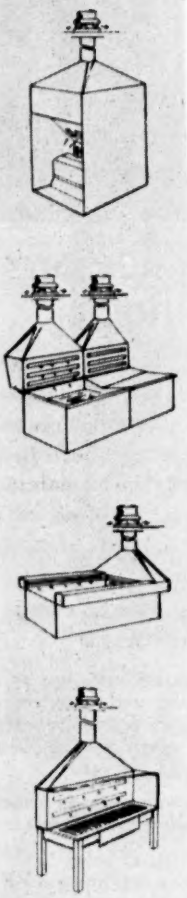
Over 35 Years of Service in Industrial Air Engineering

Dept. HV, 405 Lexington Ave. New York 17, N. Y.

Sales Engineers in Principal Cities of U. S. and Canada

You Can Be Sure
GALLAHER *CERTIFIED* RATINGS
mean *Peak Performance*

HERE'S WHY

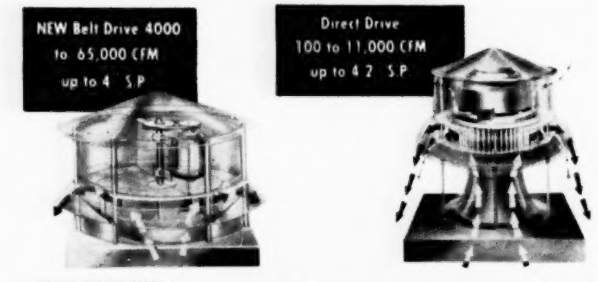


Gallaher ratings are the result of actual physical tests of the entire unit—*not* a fan wheel alone or other component, *not* interpolations of free air data, but a true picture of the unit as it operates under actual conditions.

Any other method of rating a power roof exhauster will be inaccurrate. Gallaher research has shown conclusively that the errors may run as high as 50% when ratings are mere theoretical calculations.

Gallaher units with patented, built-in *scroll effect* are the only power roof exhausters which can develop high static pressures. With this feature, thousands of industrial applications are well within the range of economical power roof exhausters. They have been rated in an independent laboratory under the direction of a nationally recognized authority under the conditions prescribed by NAFM and ASH&VE.

Before you buy power roof exhausters we think you'll agree that these three questions should be answered to your satisfaction. 1. How were the tests conducted? 2. Did it include the whole unit and not a component? 3. What impartial authority conducted the tests? We think that you'll buy Gallaher Air-Vans.



Pat. No. 2526990 2188741
Pats. pending

For full information write Dept V-6

The GALLAHER Company
4108 DODGE STREET OMAHA, NEBRASKA

Canadian Degree-Days for April, 1953*

City	April		Cumulative	
	1953	Normal	1952-53	Normal
Calgary, Alta.	1000	750	8198	8631
Charlottetown, P.E.I.	726	858	7000	7727
Crescent Valley, B. C.	690	624	6355	7328
Edmonton, Alta.	907	780	8839	9369
Fort William, Ont.	870	888	8945	9478
Grande Prairie, Alta.	996	822	9636	9617
Halifax, N. S.	646	768	6045	6902
London, Ont.	696	642	6533	6968
Medicine Hat, Alta.	846	606	7558	8194
Moncton, N. B.	737	798	7407	8094
Montreal, P. Q.	645	715	7076	8088
North Bay, Ont.	852	813	8383	8746
Ottawa, Ont.	690	726	8389	8364
Penticton, B. C.	561	507	5315	6073
Porquis Junction, Ont.	984	972	9784	10586
Prince George, B. C.	846	738	8199	8506
Quebec City, P. Q.	675	849	7745	8848
Regina, Sask.	943	816	9536	10457
St. John, N. B.	666	792	6668	7576
Saskatoon, Sask.	924	725	9722	10081
Toronto, Ont.	627	669	5937	6895
Vancouver, B. C.	487	498	4565	4977
Victoria, B. C.	524	504	4453	4569
Windsor, Ont.	642	582	5903	6454
Winnipeg, Man.	875	822	9435	10444

*These data are supplied through the courtesy of the Meteorological Division, Air Service Branch, Department of Transport, Canada.

BRIEFS

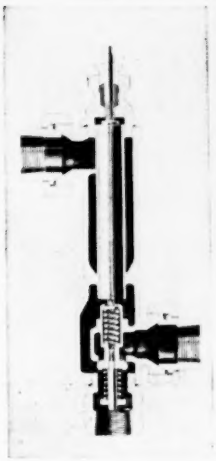
• Appointment of the Nelson Stud Welding Division of Gregory Industries, Inc., as a national distributor for the Remington stud driver and fastener studs has been announced by Remington Arms Company, Inc.

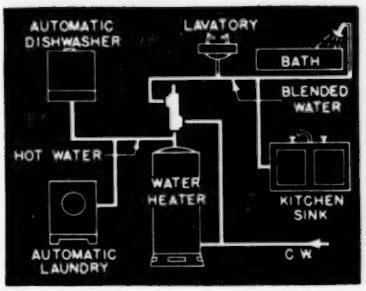
• Oscar C. Schmitt, president and director of The Emerson Electric Mfg. Co., St. Louis, Mo., suffered a heart attack on April 21, while discussing business affairs with associates, and passed away shortly thereafter. Mr. Schmitt was born in St. Louis in 1894, attended St. Louis public schools and after two years with other business houses, in 1910, he became an office worker for Emerson-Electric. He has been associated with the company continuously since that date, in numerous sales and executive capacities, except for a period in the Army during World War I, in which he was commissioned a Second Lieutenant. Mr. Schmitt was elected a vice president in 1936, and a director in 1938. Later, in 1940, he became executive vice president in which capacity he continued until he succeeded Stuart Symington as president of the company in July, 1945.

• United States Air Conditioning Corporation announced the election of a new president, Wesley J. Peoples, chairman of Institute of Boiler and Radiator Manufacturers and former president and chairman of the board of the corporation. The presidency of the company had been vacant since the death last October of Albert A. Feinberg.

(*Continued on page* 156)

Tempered Water Automatically





In the modern home, high temperature hot water is required for washing machine and dishwasher.

At the same time, in the bathroom a safe hot water temperature is 95 to 110° F.

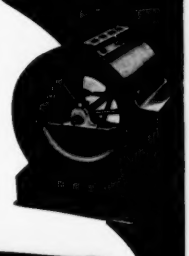
You can have both temperatures automatically from one heater by installing a Sarco Water Blender as shown in the above sketch. The Sarco Blender, by mixing cold with hot water, provides safe, tempered water for personal use. For the dishwasher and washing machine, the hotter water is supplied directly from the water heater.

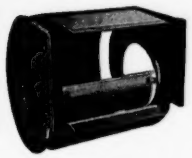
The Sarco Water Blender is a quality tempering valve sturdily constructed of brass with bronze disc. It modulates both hot and cold water flow and is tight seating. The price is surprisingly low. Write for Catalog 800-1 to *Sarco Company, Inc., Empire State Bldg., New York 1, N. Y.* *Advt. 602*

MASSACHUSETTS

BLOWERS

Air Conditioning Furnace Blower Assembly. Designed for manufacturers of warm air furnaces and Air Conditioning equipment. Wheel Sizes 7½" to 27"





Housing Sides—Cutoff Plate and scroll Sheet.

Heavy gauge steel stampings.

End Spider suspension type wheel assembly.

Write for catalogs.

MANUFACTURERS OF CENTRIFUGAL BLOWERS FOR 36 YEARS

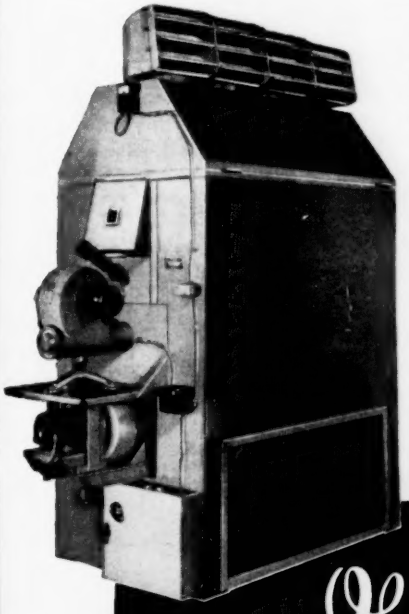
MASSACHUSETTS BLOWER DIVISION

The BISHOP & BABCOCK Mfg. Co.

4901 HAMILTON AVENUE CLEVELAND 14, OHIO

A STRAIGHT LINE

A straight line is the shortest distance between two points. Likewise, the more heat transfer surface, the more efficiency and longer life for a heating unit. Olson, through the use of standard 10 gauge, 4" O. D. boiler tubes, gives more effective heat transfer surface than the highest recommendations of accepted heating authorities.



Olson unit or central warm air heaters are manufactured for stokers, oil, gas or dual gas and oil to fit the needs of all regions and various structures.

Olson

ARTHUR A. OLSON & CO.

Gas, Oil, Coal or Dual Gas and Oil

BROAD ST. - CANFIELD, OHIO

WRITE FOR COMPLETE INFORMATION AND DATA SHEET SHOWING HORIZONTAL AND INVERTED MODELS, STOKER FIRED AND DUCT UNITS.

greater efficiency for

Commercial and Industrial

GAS

fired heating plants with

field

"M-G" draft controls

1. Double acting gate opens inward to regulate up-drafts and outward to relieve down-drafts.
2. Adding or taking off weights provide simple adjustment for up-draft conditions at time of installation.
3. Control will relieve internal or down-draft pressures of only a few thousandths of an inch.
4. Weights attached to gate itself are factory set to insure extreme sensitivity to down-draft conditions.
5. Corrosion resistant knife edge bearings resting on self-aligning bearing plates assure extreme sensitivity yet long life.
6. Side wings improve the regulation, making the control accurate at all gate positions.
7. Long collar keeps gate out of the path of flue gases—resulting in greatly increased life.

Now there is a Field Draft Control to provide for commercial gas-fired heating plants the same accurate, dependable, fuel-saving performance that has made Field first choice for oil and coal furnaces. The new Field "M-G" for gas is fully proven, widely accepted, fully safe — a control specially designed for gas but retaining all outstanding design features of the Field Type M Control. Write today for complete information.

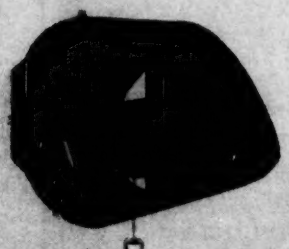
FIELD CONTROL DIVISION

of H. D. Conkey & Company — Mendota, Illinois

AFFILIATES: Conco Building Products, Inc.—Brick, Tile, Stone
Conco Materials Handling Division—Cranes, Hoists

UP-DRAFT VIEW

Gate opens inward to regulate updrafts in conventional, proven manner, checking any excess in draft.



DOWN-DRAFT VIEW

Gate opens outward to relieve down drafts which might affect flame. An optional safety switch closes main gas valve in case of prolonged down draft, thus providing full protection.

(*Continued from page 154*)

• A thoroughly modern office building for the exclusive use of Carrier Corp. will be opened in Atlanta, Georgia, about October 1, it was announced by William Bynum, executive vice president. The new building will be located at 2005 Peachtree Road, about four miles northeast of downtown Atlanta. Groundbreaking has already taken place. The new two-story building will be essentially windowless, completely air conditioned and will contain approximately 22,000 sq ft of floor space.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

NDHA MEETING—44th annual meeting of the National District Heating Association, at Lookout Mountain Hotel, Chattanooga, Tenn. John F. Collins, secretary of the Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. ..... **JUNE 9-12, 1953.**

I-B-R-SHORT COURSE—7th Short Course on hot water and steam heating systems, at the University of Illinois, Urbana, Ill. Sponsored by the University of Illinois and The Institute of Boiler & Radiator Manufacturers. Secretary, Plumbing and Heating Industries Bureau, 35 East Wacker Dr., Chicago 1, Ill. ..... **JUNE 15-18, 1953**

WELDING SOCIETY MEETING—National Spring Technical Meeting of the American Welding Society, at Shamrock Hotel, Houston, Texas. Secretary of the Society, 33 W. 39th St., New York 18, N. Y. ..... **JUNE 16-19, 1953.**

ENGINEERING EDUCATION MEETING—61st annual meeting of the American Society for Engineering Education, at the University of Florida, Gainesville, Fla. Prof. John C. Reed, head of mechanical engineering at the University, Gainesville, Fla. ..... **JUNE 22-26, 1953.**

ASRE MEETING—Spring meeting of the American Society of Refrigerating Engineers, at the Lake Placid Club, Lake Placid, N. Y. M. C. Turpin, secretary of the Society, 40 W. 40th St., New York, N. Y. ..... **JUNE 28—JULY 1, 1953.**

ASHVE MEETING—1953 semi-annual meeting of the American Society of Heating and Ventilating Engineers, at the Cosmopolitan Hotel, Denver, Colo. A. V. Hutchinson, secretary of the Society, 62 Worth St., New York 13, N. Y. ..... **JUNE 29—JULY 1, 1953**

TESTING MATERIALS MEETING—Annual meeting of the American Society for Testing Materials, at Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. ..... **JUNE 29—JULY 3, 1953.**

INSTRUMENT EXHIBIT—8th National Instrument Conference and Exhibit of the Instrument Society of America, at the Sherman Hotel, Chicago, Ill. John McCaffery, assistant executive secretary of the Society, 1319 Allegheny Ave., Pittsburgh 33, Pa. ..... **SEPTEMBER 21-25, 1953.**

CORROSION ENGINEERS MEETING—Meeting of the South Central Region, National Association of Corrosion Engineers, at the Mayo Hotel, Tulsa, Okla. Executive secretary of the Association, 1061 M & M Bldg., Houston 2, Tex. ..... **OCTOBER 7-9, 1953.**

INDUSTRIAL HYDRAULICS CONFERENCE—Ninth annual National Conference on Industrial Hydraulics, sponsored by the Illinois Institute of Technology, at Sheraton Hotel, Chicago, Ill. Otmar E. Teichmann, conference director, Illinois Institute of Technology, Chicago 16, Ill. ..... **OCTOBER 8-9, 1953.**

AGA CONFERENCE—Annual conference of the American Gas Association, at Kiel Auditorium, St. Louis, Mo. Secretary of the Association, 420 Lexington Ave., New York, N. Y. ..... **OCTOBER 26-28, 1953.**

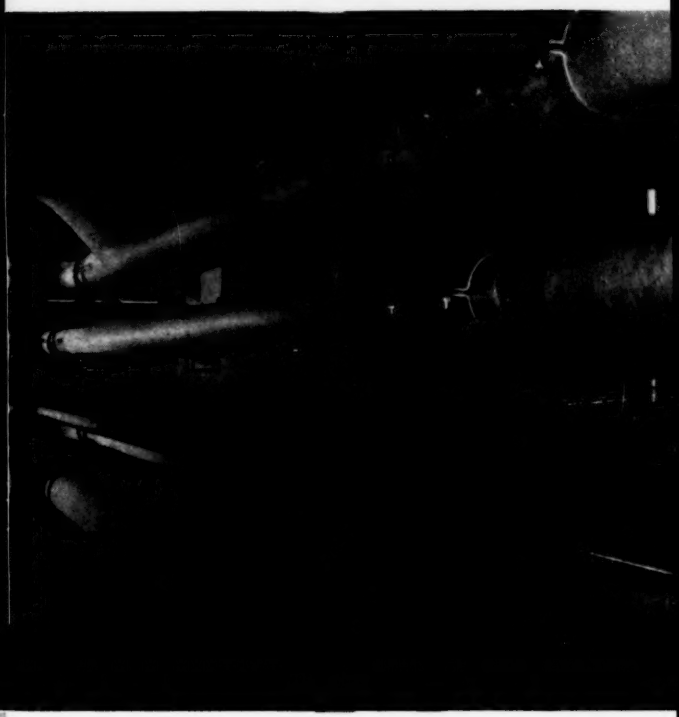
ALL-INDUSTRY EXPOSITION—8th All-Industry Refrigeration & Air Conditioning Exposition, at the Public Auditorium, Cleveland, Ohio. Geo. E. Mills, show director, 1346 Connecticut Ave., Washington 6, D. C. ..... **NOVEMBER 9-12, 1953.**

install piping runs *with Versatile* UNISTRUT®

METAL FRAMING

The modern way to rack piping

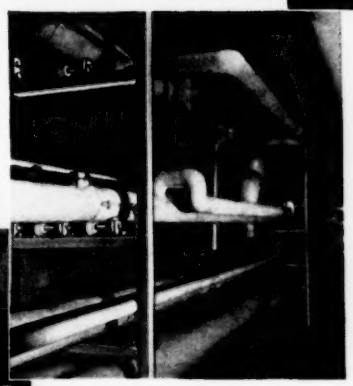
Tunnel job showing how UNISTRUT continuous run concrete inserts can be installed vertically or horizontally, or at any angle required.

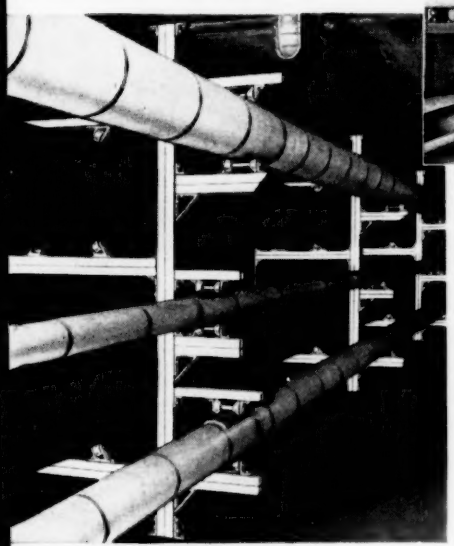


UNISTRUT Products are Bonderized

Typical piping installation supported by UNISTRUT framing, concrete inserts and roller pipe supports. Slotted channel permits attachment of fittings at any desired point.

Note how UNISTRUT framework's great strength easily supports long runs of heavy piping, including bulky 16" chilled water lines.





Adjustable Framing System

assures exact pitch, permits changes or additions at any time—no special tools or equipment needed.

Conserves Steel, Reduces Manpower Hours, Cuts Over-all Costs

The UNISTRUT system of mechanical supports includes steel channel, roller pipe supports, concrete inserts, brackets, clamps, pipe hangers and many other standard parts which combine to form the world's most flexible system of support or suspension.

You save time in engineering detailing and eliminate the need for trained erection crews—you get fast, on-the-job framing assembly where adjustments are made and supporting members added as the work progresses. Try it on your next piping job!

Write for NEW Free 84-page Pocket Catalog No. 800!

U. S. Patent Numbers
2327587 2329815 2345650
2363382 2380379 2405631
2541908 Other Patents Pending

UNISTRUT®

The World's Most Flexible All-Purpose Metal Framing

For the Man on the Job!
84 pages packed with photos, drawings, ideas and data on how to frame, mount, rack, hang and support all kinds of mechanical and electrical equipment with adjustable UNISTRUT metal framing.

Distributors and Warehouse Stocks in Principal Cities. Consult your Telephone Directories.

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Please send me a copy of the new UNISTRUT Pocket Catalog No. 800, without obligation.

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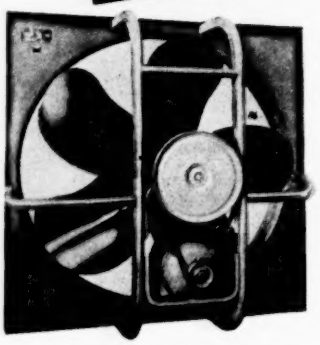
INCREASE your production with efficient–

CHELSEA

INDUSTRIAL

FANS

—A TYPE FOR EVERY APPLICATION!



CHELSEA TYPE IND EXHAUST FAN
For factories, mills, theatres, schools, hotels and churches. Features belt drive with ball bearing motor and fan shaft. Sizes from 24" to 72".

TYPE MC MANCOOLER BELT DRIVEN

TYPE PLF POWER LINE EXHAUST FAN

TYPE BB ALL PURPOSE EXHAUST FAN

TYPE PHD PENTHOUSE UNIT

TYPE PLDX POWER LINE DUCT BOOSTER

TYPE PLDU POWER LINE AIR BLASTER

STEP-UP OUTPUT and quality of workmanship, reduce industrial accidents and employee fatigue with proper ventilating and cooling equipment. **CHELSEA** Fans remove excessive heat, fumes, dirt, dust and grit, also dead stale air. 30 models, in over 200 sizes, are available, and each fan or blower is especially engineered and tested for its recommended applications. All ratings are certified by P.F.M.A. test methods to insure proper performance. Check on your ventilating requirements, now.

NEW CATALOG No. 400 now available!
Complete data and specifications on fans and blowers for every industrial and commercial application—address requests to Dept. N-6

Certified Ratings

PROPER VENTILATION IS AN INVESTMENT!
Look for this Symbol of Quality . . . →
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CHELSEA

CHELSEA FAN & BLOWER CO., Inc.
PLAINFIELD, NEW JERSEY

DEGREE-DAYS FOR APRIL, 1953

(A) Airport readings; (C) city office readings;
(O) Readings at a point on outskirts of city.

HEATING AND VENTILATING'S 25th Year of Publication of Monthly Degree-Day Data

City	April		
	1953	1952	Normal
Abilene, Texas (A)	102	114	27
Albany, New York (A)	544	436	549
Albuquerque, New Mexico (A)	298	264	288
Alpena, Michigan (C)	776	606	789
Anaconda, Montana (C)	805	584	756
Asheville, North Carolina (C)	318	278	330
Atlanta, Georgia (C)	180	143	132
Atlantic City, New Jersey (C)	396	369	519
Augusta, Georgia (A)	144	135	24
Baker, Oregon (C)	(a)	502	615
Baltimore, Maryland (C)	327	267	348
Billings, Montana (A)	734	412	534
Binghamton, New York (C)	538	429	594
Birmingham, Alabama (A)	173	167	69
Bismarck, North Dakota (A)	826	512	657
Block Island, Rhode Island (A)	534	505	633
Boise, Idaho (A)	561	376	435
Boston, Massachusetts (A)	475	432	570
Bozeman, Montana (C)	802	574	731
Buffalo, New York (A)	625	496	675
Burlington, Iowa (A)	546	395	(a)
Burlington, Vermont (A)	627	567	654
Butte, Montana (C)	832	608	741
Cairo, Illinois (C)	298	226	201
Charleston, South Carolina (C)	65	77	36
Charlotte, North Carolina (C)	191	178	159
Chattanooga, Tennessee (A)	237	175	144
Cheyenne, Wyoming (A)	844	660	720
Chicago, Illinois (C)	564	424	518
Cincinnati, Ohio (C)	366	289	333
Cleveland, Ohio (A)	581	450	564
Columbia, Missouri (A)	435	343	303
Columbia, South Carolina (C)	109	110	63
Columbus, Ohio (C)	495	367	420
Concord, New Hampshire (A)	593	543	669
Concordia, Kansas (C)	486	415	342
Dallas, Texas (A)	124	121	9
Davenport, Iowa (C)	(a)	375	453
Dayton, Ohio (A)	531	409	396
Deer Lodge, Montana (C)	771	554	735
Denver, Colorado (C)	660	496	534
Des Moines, Iowa (A)	601	448	441
Detroit, Michigan (A)	616	463	573
Devils Lake, North Dakota (C)	871	513	756
Dodge City, Kansas (A)	441	420	342
Dubuque, Iowa (C)	659	482	489
Duluth, Minnesota (C)	867	605	801
Eastport, Maine (A)	636	690	786
Elkins, West Virginia (A)	514	461	501
El Paso, Texas (A)	69	94	45
Ely, Nevada (A)	749	654	(a)
Erie, Pennsylvania (C)	591	465	609
Escanaba, Michigan (C)	793	645	828
Evansville, Indiana (A)	376	302	276
Fargo, North Dakota	819	525	679
Fort Smith, Arkansas (A)	255	219	93
Fort Wayne, Indiana (A)	581	452	474
Fort Worth, Texas (A)	127	110	27
Fresno, California (A)	185	139	135
Galveston, Texas (C)	27	30	0
Grand Junction, Colorado (A)	466	349	384
Grand Rapids, Michigan (A)	658	517	534
Green Bay, Wisconsin (C)	707	537	600
Greensboro, North Carolina (A)	252	230	210
Greenville, South Carolina (A)	174	149	195
Harrisburg, Pennsylvania (A)	417	339	405
Hartford, Connecticut (A)	467	412	531
Hatteras, North Carolina (C)	135	112	255
Havre, Montana (C)	783	413	630
Helena, Montana (A)	748	525	646
Houston, Texas (C)	30	40	0
Huron, South Dakota (A)	728	492	570
Indianapolis, Indiana (A)	516	390	384
Jackson, Mississippi (A)	112	132	(a)
Kansas City, Missouri (A)	431	334	691
Knoxville, Tennessee (A)	274	193	210
La Crosse, Wisconsin (A)	679	474	528
Lander, Wyoming (A)	783	534	690

(a) Data not available.

City	April		
	1953	1952	Normal
Lansing, Michigan (A)	663	531	582
Lewiston, Maine (O)	522	551	693
Lincoln, Nebraska (C)	533	438	417
Little Rock, Arkansas (A)	213	198	78
Livingston, Montana (C)	797	495	653
Los Angeles, California (C)	180	129	159
Louisville, Kentucky (A)	366	291	264
Lynchburg, Virginia (A)	288	278	273
Macon, Georgia (A)	113	104	33
Madison, Wisconsin (C)	664	459	582
Marquette, Michigan (C)	859	612	804
Memphis, Tennessee (A)	215	215	96
Meridian, Mississippi (A)	126	130	24
Milwaukee, Wisconsin (A)	672	512	648
Minneapolis, Minnesota (A)	714	475	570
Moline, Illinois (A)	570	399	(a)
Montgomery, Alabama (A)	120	116	0
Nantucket, Massachusetts (A)	572	551	639
Nashville, Tennessee (A)	282	234	180
New Haven, Connecticut (A)	488	432	543
New Orleans, Louisiana (C)	28	24	0
New York, New York (C)	417	334	465
Newark, New Jersey (A)	405	336	448
Norfolk, Virginia (C)	179	175	246
North Head, Washington (C)	514	517	516
North Platte, Nebraska (A)	651	525	486
Oakland, California (C)	314	232	273
Oklahoma City, Oklahoma (C)	284	253	162
Omaha, Nebraska (A)	551	426	414
Oswego, New York (C)	(a)	531	675
Parkersburg, West Virginia (C)	411	319	351
Peoria, Illinois (A)	533	390	453
Philadelphia, Pennsylvania (C)	345	291	378
Phoenix, Arizona (C)	39	46	0
Pittsburgh, Pennsylvania (C)	436	396	423
Pocatello, Idaho (A)	649	520	567
Portland, Maine (A)	620	629	666
Portland, Oregon (C)	394	371	402
Providence, Rhode Island (C)	456	416	558
Pueblo, Colorado (A)	489	421	456
Raleigh, North Carolina (C)	178	173	183
Rapid City, South Dakota (A)	792	447	594
Reading, Pennsylvania (C)	393	313	417
Red Bluff, California (A)	225	136	(a)
Reno, Nevada (A)	579	509	534
Richmond, Virginia (C)	222	223	246
Rochester, New York (A)	603	478	618
Roswell, New Mexico (A)	171	166	180
Sacramento, California (C)	203	161	207
St. Joseph, Missouri (A)	493	370	342
St. Louis, Missouri (C)	385	318	276
Salt Lake City, Utah (A)	551	388	453
San Antonio, Texas (A)	36	50	0
San Diego, California (A)	172	153	174
Sandusky, Ohio (C)	573	441	726
San Francisco, California (C)	364	295	294
Sault Ste. Marie, Michigan (A)	841	679	819
Savannah, Georgia (A)	87	80	0
Scranton, Pennsylvania (C)	517	399	513
Seattle, Washington (C)	434	379	462
Sheridan, Wyoming (A)	779	478	648
Shreveport, Louisiana (A)	89	122	0
Sioux City, Iowa (A)	634	470	489
Spokane, Washington (A)	574	455	504
Springfield, Illinois (C)	442	352	366
Springfield, Missouri (A)	443	343	267
Syracuse, New York (A)	573	460	630
Tacoma, Washington (C)	616	647	465
Terre Haute, Indiana (A)	471	367	333
Toledo, Ohio (A)	608	476	525
Topeka, Kansas (C)	443	353	300
Trenton, New Jersey (C)	394	318	402
Utica, New York (O)	630	595	588
Valentine, Nebraska (C)	763	493	561
Walla Walla, Washington (C)	386	274	363
Washington, D. C. (C)	276	258	348
Wichita, Kansas (A)	403	338	252
Williston, North Dakota (C)	861	429	669
Winnemucca, Nevada (C)	644	464	539
Yakima, Washington (A)	500	404	360

(a) Data not available.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y.; and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

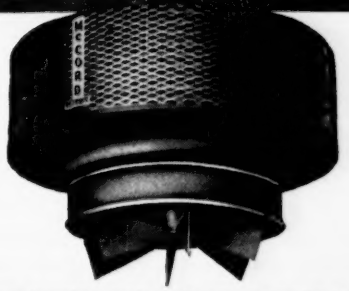
McCORD

HEATING AND AIR CONDITIONING PRODUCTS

HORIZONTAL TYPE UNIT HEATERS

Modern design—top performance—thousands in use—dependable heat. All copper coils to resist corrosion — individual tube expansion — most rugged construction — quiet operation — easy installation—standard motors with standard bases. Sizes to 272,000 B.T.U. capacity.

VERTICAL TYPE UNIT HEATERS



A proven heating unit—all copper coils to resist corrosion. McCord spiral tube fin construction creates air turbulence without undue restriction. Improved fan delivers large volume of air, with minimum air noise. All McCord heaters are guaranteed for use with 150 lbs. saturated steam pressure. Sizes to 575,000 B.T.U. capacity.

McCORD CORPORATION
DETROIT 11, MICH.

GET MORE OUT OF YOUR SPRAYING EQUIPMENT WITH LESS POWER

For spraying, washing, rinsing, cooling and air conditioning, Yarway Spray Nozzles will improve the efficiency of your spray equipment.

There are no internal vanes or other restrictions to clog or hinder the flow.

Cast bronze Involute-type

Bar stock Involute-type

Bar stock Fan-spray-type

Yarway Spray Nozzles are available in two types—the Yarway Involute producing fine hollow cone spray with minimum energy loss, and the Yarway Fan-spray for flat fan-shaped spray with time-saving slicing action for cleaning.

Wide range of standard sizes and capacities. Made of metal castings or machined from solid bar stock.

The 20-page Yarway Spray Nozzle Bulletin contains not only complete details on Yarway Spray Nozzles and Fittings, but also much helpful information on the many uses for spray nozzles. Ask for a free copy—Bulletin N-617.

YARNALL-WARING COMPANY

104 Mermaid Ave., Philadelphia 18, Pa.

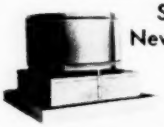
YARWAY / *spray nozzles*

Every COOK Fan Blade is *Individually* precision set

- All blades balanced and set to proper pitch for rated horsepower and CFM.
- Aluminum hub and blade, cast separately, machined and fitted with precision accuracy.
- Blade is securely locked to hub for long life and true pitch by taper pin bolt.

The cut-away photo above shows why rugged Cook Fans last longer and actually deliver their stated capacity. Each blade is individually set to the proper pitch for the rated horsepower and CFM. Thousands of Cook-built propellors have already proved their dependability.

Sell Cook Industrial Fans and the New Cook "Chimney Style"* Attic Fan



Up-Blast Roof Ventilator in 16" to 48" sizes. Automatic dampers. Acid resistant coated, aluminum blades, up to 40,000 cfm output.

*Patent pending.

New "Chimney Style" Attic Fan saves attic space. Acid resistant coated steel chimney housing a direct drive fan. Easy to install, automatic dampers. Three sizes.

Cook Duct Fans. Direct or belt drive. Orifice 16" to 48". Ideal for spray booths.

Cook Type S Fans. Frame 24" to 48". Easy to install. Glass-insulated or explosion proof.

Portable Man-Cooler. Adjustable welded steel frame on rollers. Propellor 16" to 48".

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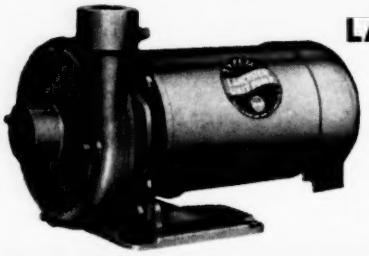
Reliable Performance

Low cost centrifugal pumps with mechanical seals, balanced bronze impellers, ball bearings.

1/4 to 1 1/2 H.P. Motors.

FOR AIR-CONDITIONING



LANCASTER UNIT PUMPS TYPE M

FOR CIRCULATION JOBS

LANCASTER *pumps*

ALSO AVAILABLE

LANCASTER UNIT PUMPS

from 2-50 H.P. and heads to 300'

Capacities to 1000 G.P.M.

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LANCASTER PUMP AND MANUFACTURING CO., Inc.

LANCASTER, PENNSYLVANIA

• ARE YOU INTERESTED IN PERIMETER HEATING?

A-J

This diffusing type floor register was carefully engineered, in cooperation with heating specialists, to provide the answer for a perfect outlet for perimeter heat!

It's ruggedly constructed. The heavy gauge curved vanes are factory-set to deliver a uniform fan-shaped pattern of air to cover the window areas or cold outer walls.

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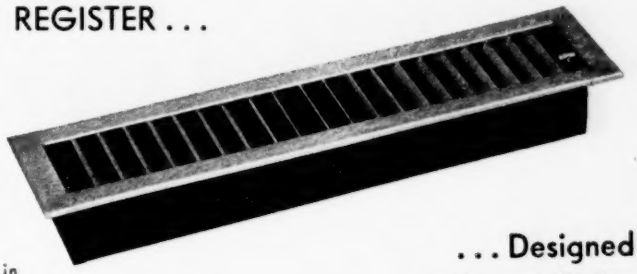

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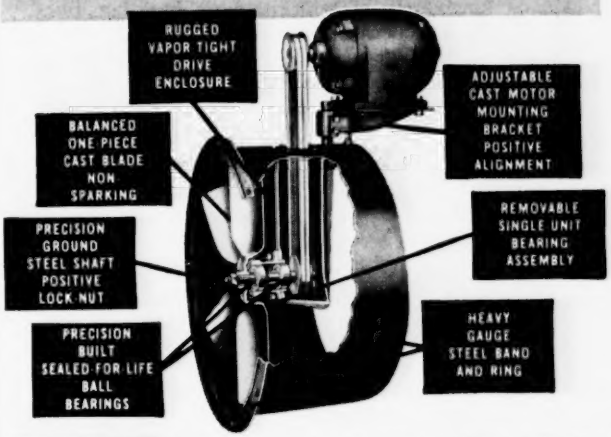
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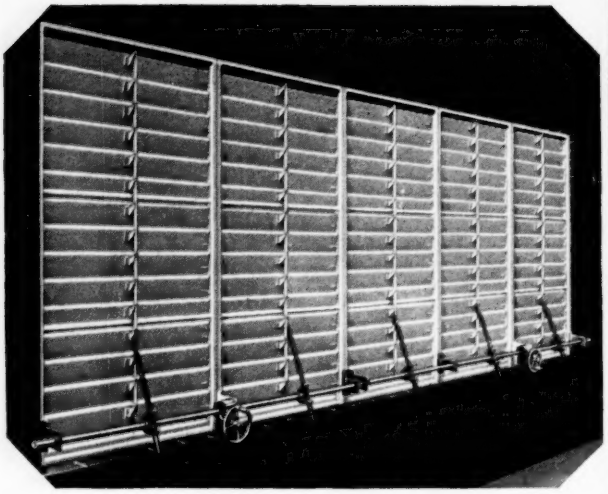

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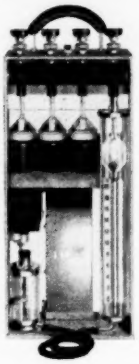

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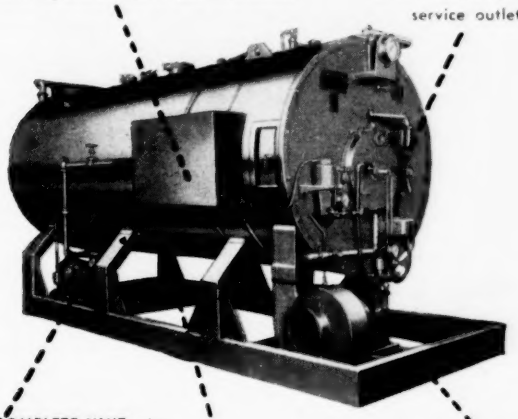

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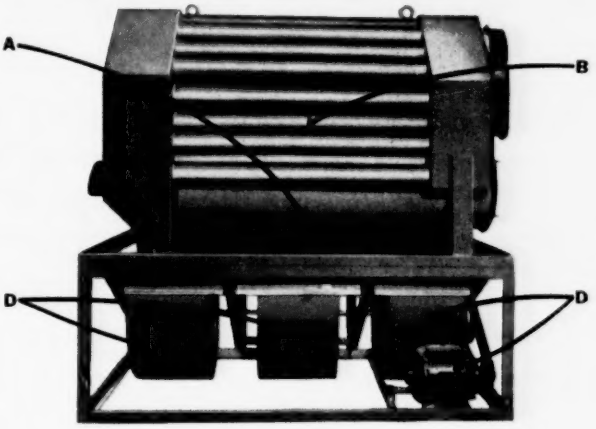

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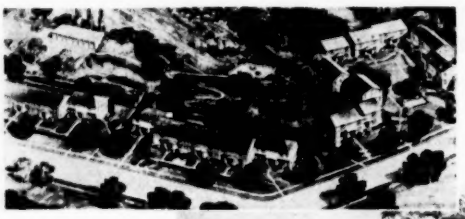

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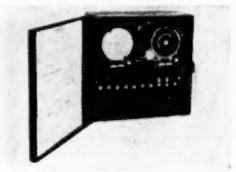

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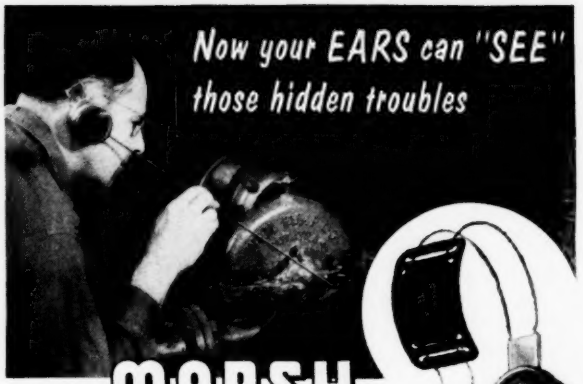

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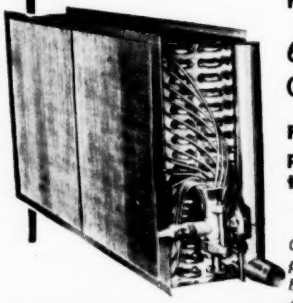

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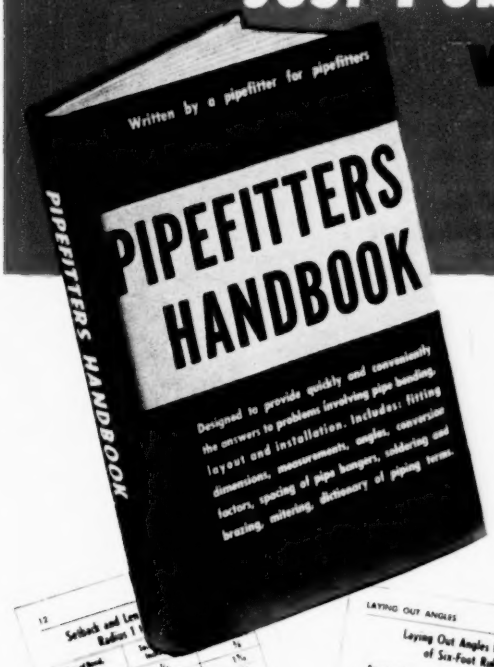
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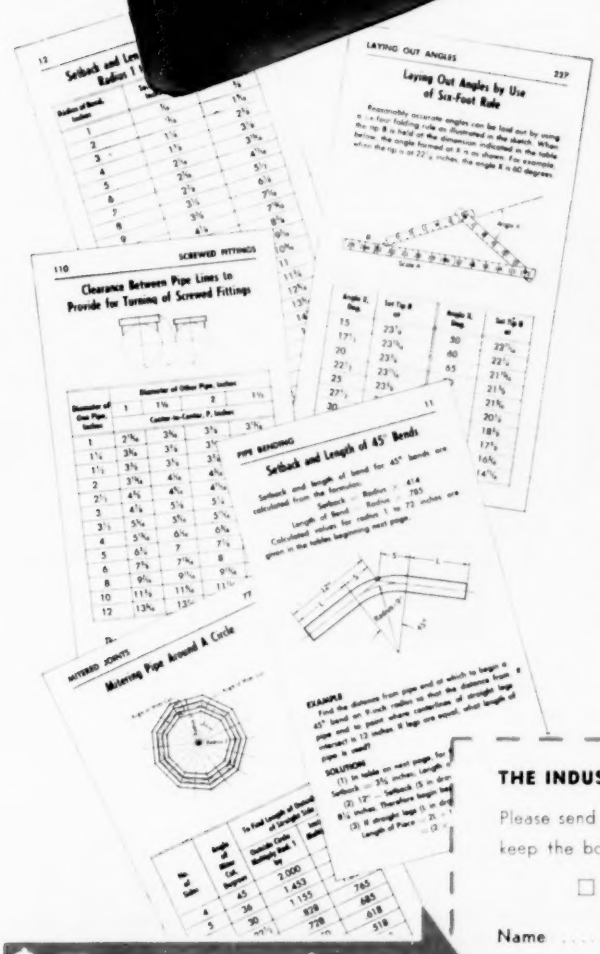
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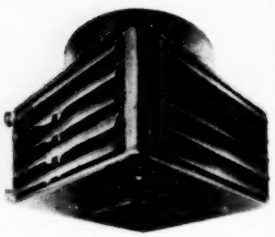

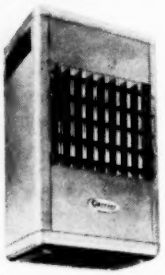

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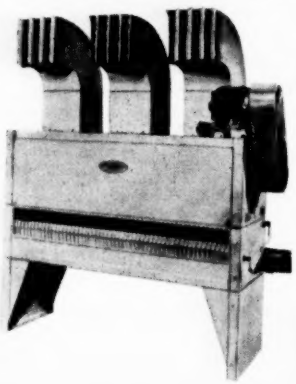

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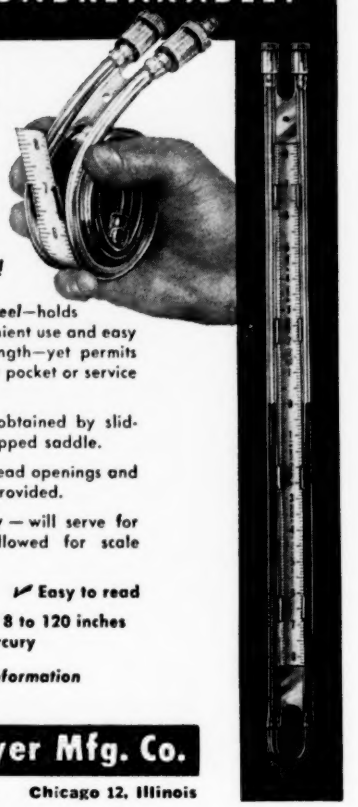

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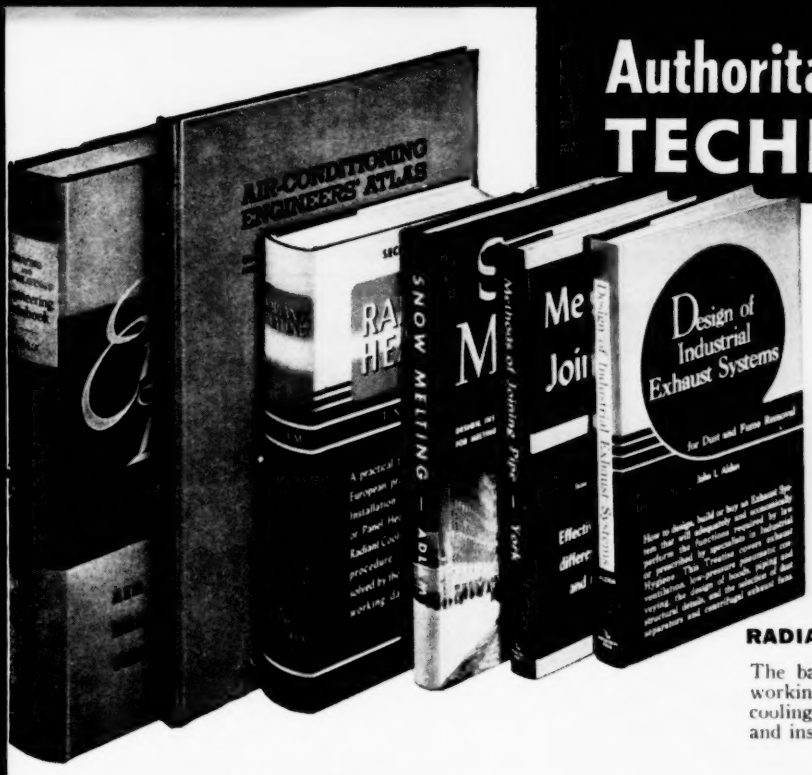

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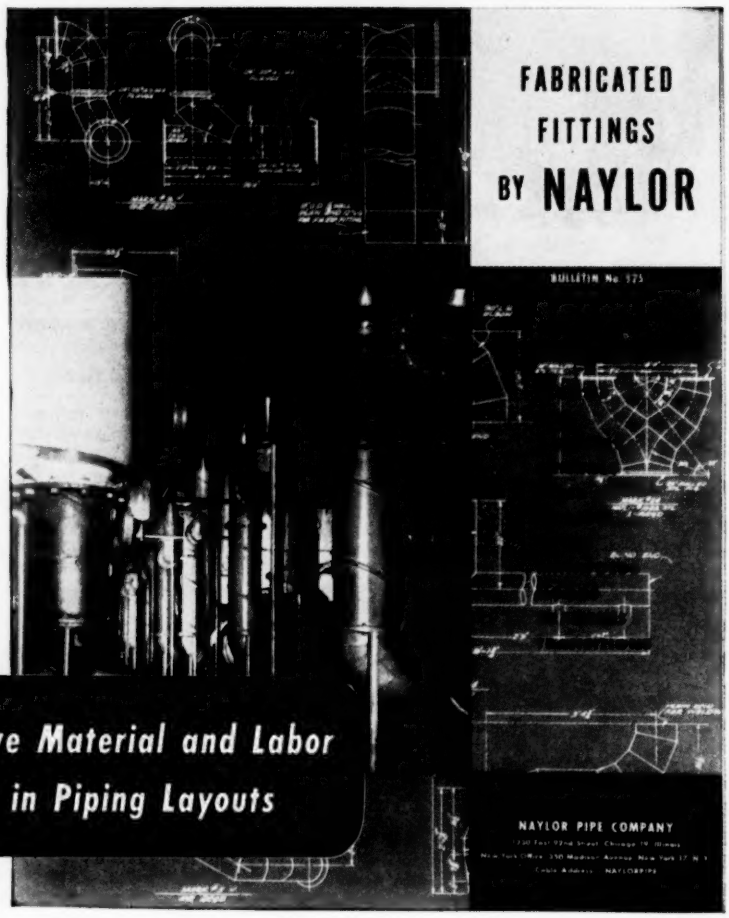

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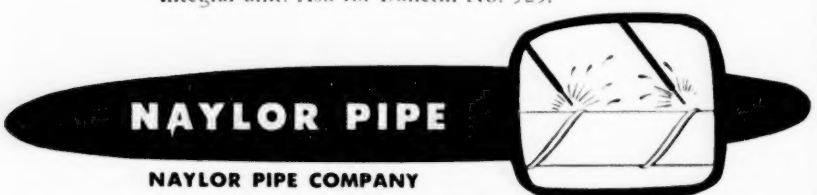

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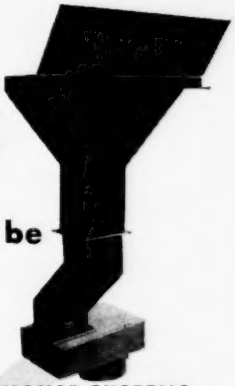

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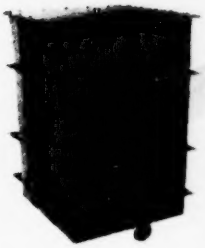

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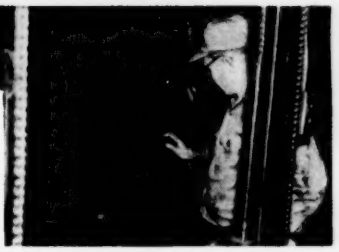

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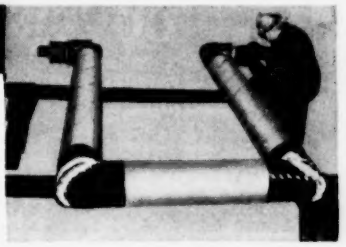

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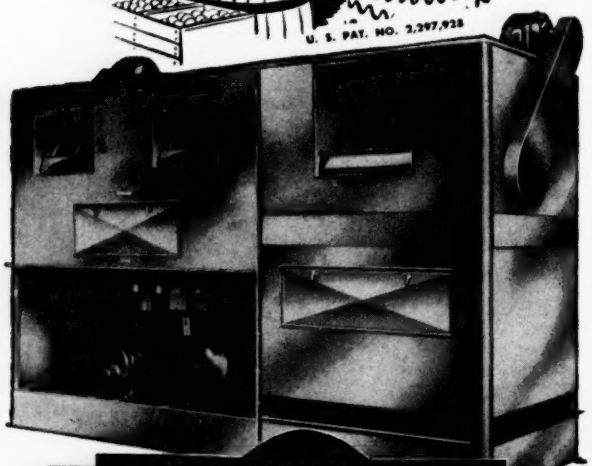

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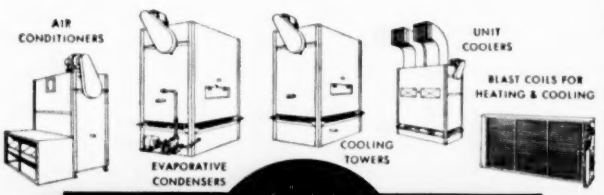

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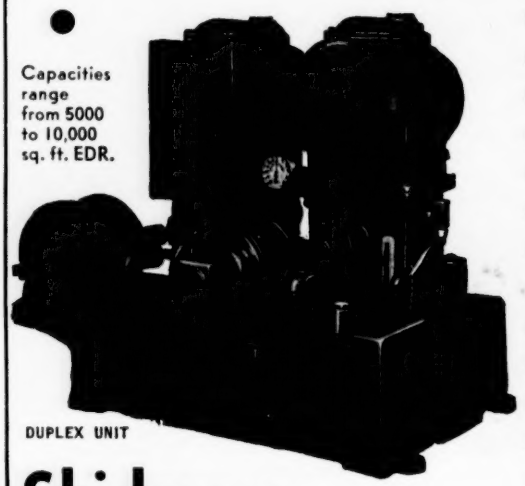

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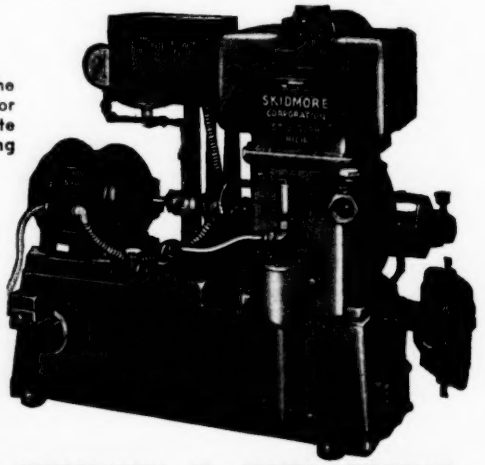

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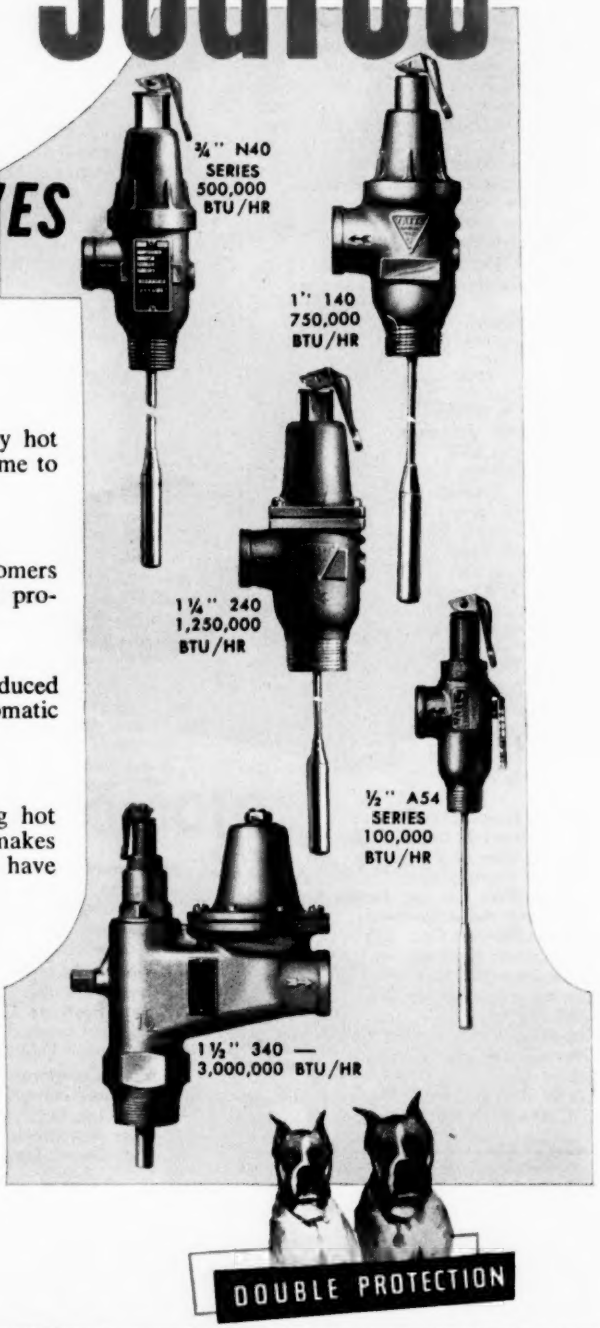
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SERVICING THE COOLING PLANT FOR SUMMER USE

The following practical suggestions for putting the summer air conditioning system into operation were compiled by K. E. Sontag, The Trane Company:

Because all air conditioning systems are practically "tailor-made," it is impossible to give explicit instructions which will be applicable to every installation. Therefore, while the points listed are general points, they are important whether they require the adjustment of 20 valves or one valve to make the system operate properly.

(1) Check coils in the cooling system. Plugs may have been removed and system drained for winter. Replace plugs and close valves to the coils. Be certain that all valves to coils are closed before cracking the main water supply valve to allow gradual filling of system. If coils are located in several equipment rooms on different floors, start at the bottom of the system venting coils in each equipment room from first floor to top of system.

(2) If a deep well pump is part of the system, it should be checked for proper lubrication and electrical connections. After all valves are open, trip pump switch for momentary operation of pump. Do this two or three times. If operation is normal, throw switch for regular operation.

(3) After the system has operated for two days, recheck coils for air binding.

The procedure for preparing air handling equipment for operation is the same whether the system uses water or mechanical refrigeration as the source of cooling. Here again there are a number of important steps in setting the system in operation.

(1) Check the motors for proper lubrication and electrical connections.

(2) Check the fan, bearings and belts to see that they are in operating condition.

(3) Do not forget the filters. While checking the filters for cleanliness also check the surface of the coil to see that it is clean. One building owner had his serviceman start up the system after a check, but he got no cooling—in fact, he got no air distribution at all. The filters were clogged with dust and dirt to such an extent that air could not be drawn into the system.

If it is possible to manually operate the air handling equipment on the spot, check it for noise and general operating characteristics.

Before proceeding further, check the oil pressure in the crankcase of the compressor. The normal operation of shutting down a refrigeration plant for the season is to leave 2 lb pressure in the system. Now, before opening any valves, observe this pressure to determine if there was a loss of pressure during the shutdown period. A lower pressure indicates a leak in the system. Remember that both Freon and oil will escape through the defective part. How to search out these leaks is described later.

If there is an evaporative condenser in the system, it should be next on the check list. In a good many installations, the evaporative condenser is mounted on the roof. The service suggestions here are simple to accomplish, provided the unit was serviced properly when the system was shut down at the end of the season the previous fall.

(1) Here again motors, fans and belts are first on the list for checking and servicing. V-belts should be free from wear and have a live feeling when struck with the hand. They should not be "fiddle-string" tight.

(2) For outdoor installations, the next step is to clean out the sump. If there is water in the sump, start looking for trouble. This, very possibly, indicates the unit was not properly drained and lines in the system may have frozen and ruptured. Before going ahead with the check-up, inspect the piping that is exposed to the elements or where freeze-up may occur.

(3) Close the drain on the sump.

(4) Open the water supply valve to the unit and at the same time check the operation of the float valve in the sump.

(5) Check the operation and for leaks in pump. First, turn the pump over by hand to check freedom of operation. Then with the pump operating electrically, check for leaks. There should be a slight leak at the packing for the pump to be operating at its best. This leak should amount to a rather infrequent drip and not a steady flow from the packing.

(6) Examine the coil for corrosion or fouling. If the coil is fouled with scale, it should be cleaned with an inhibited acid. After using the inhibited acid, the coils should be well flushed with clear water to remove the cleaner.

(7) If the liquid receiver is mounted near the evaporative condenser, now is the time to open both valves in the liquid receiver.

On some installations, there is a shut off valve in the hot gas line on the evaporative condenser. This valve should be opened as the last step in getting this unit ready for operation.

If the system uses a shell and tube condenser instead of an evaporative condenser, there are two inspections to make. (1) Open the valve for the water supply to the condenser. (2) Use a screw driver to momentarily open the water regulating valve on the condenser: This will flush the valve mechanism and put it in readiness for operation.

Refrigeration Unit

All parts of the system are important, but the refrigeration unit is the most vital. Every precaution and check must be made to certify the correct operation of this unit.

(1) First of all, make the usual inspections for proper motor lubrication, electrical connections and condition of

belts, if belt-driven. If direct-driven, inspect the coupling for signs of wear.

(2) Open all valves on the unit. These include the liquid valve, suction valve, and hot gas discharge valve. It's a good idea to double check this operation. Things can happen very fast if one or more valves remain shut during operation of the compressor.

(3) Check electrical connections to the compressor. The main fuse disconnect switch has probably been locked in the open position to guarantee non-operation of the unit during the seasonal shut-down. This should be unlocked and closed at this time.

(4) Next, throw compressor switch in and out two or three times. Allow compressor to run a few seconds each time the switch is thrown in to get oil on the seal. This short periodic operation also helps to separate the Freon from the oil.

(5) Put the system into operation. This includes starting up the air handling equipment, evaporative condenser (if included in the system) and compressor. If there is a gage on the crankcase, observe the oil pressure. It should be above the pressure in the suction line. Observe the oil in the crankcase. If low, one of two things has happened. Oil may have mixed with the Freon and be held in another part of the system, or oil has escaped through a Freon leak. To determine which of these malfunctions has occurred, run the compressor intermittently for several seconds to try and separate the oil and Freon. If, after several tries, the oil level still remains low, there may be leaks in the system. Check Freon charge through the sight glass on the liquid line. If it bubbles while the compressor is in operation, the charge is short. This is another signal that troubles are present.

(6) Shut down the system and close valves. Leaks may be discovered in two different manners. A halide torch may be used for this purpose. Escaping Freon will turn the color of the torch flame for it is extremely sensitive to the presence of Freon. The other method is to examine the piping system for oil droplets hanging to the underside of the piping. While the Freon escapes into the air, the oil usually clings to the piping in the vicinity of the leak.

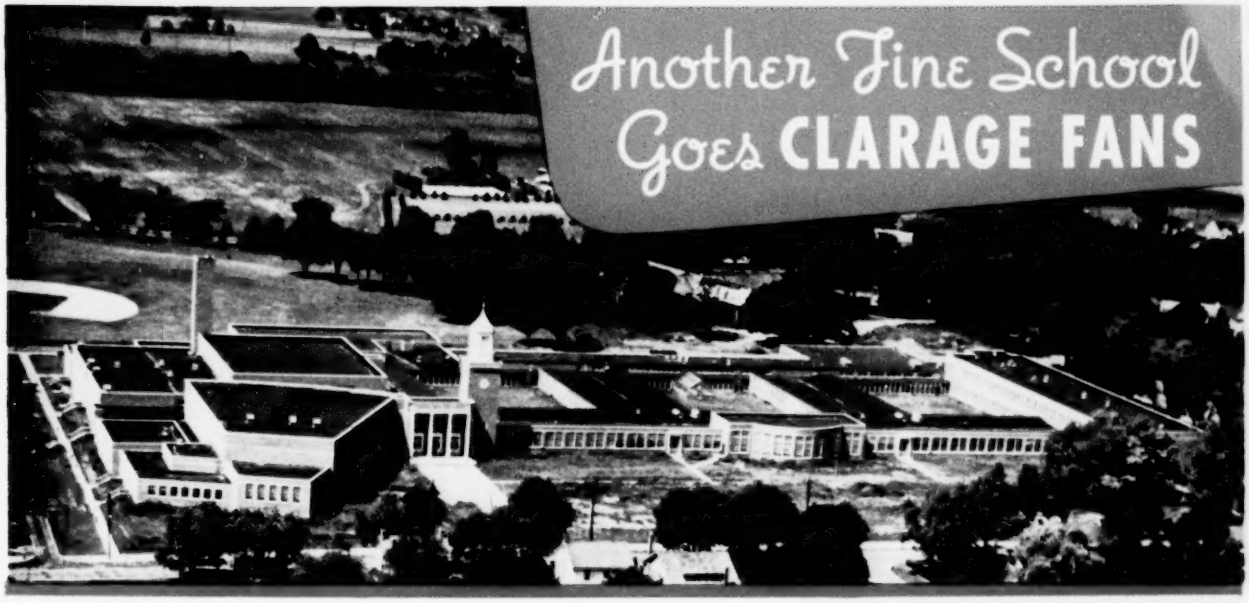
There is another possibility, in case the leak cannot be discovered. A previous leak may have been repaired, Freon added, but the oil forgotten. To correct this requires only the addition of compressor oil.

When the system is in shape again, add the necessary refrigerant and oil. Always remember to add both Freon and oil. When there is a leak in the system, both the lubricating oil and the refrigeration charge will escape.

Compressor Now Ready

A few final inspections remain before placing the unit in operation for the summer. You are now ready to start the air handling unit and the compressor. Run the compressor for approximately 30 minutes. At the end of this time observe the oil in the crankcase and check the condition of the Freon in the sight glass. If everything appears correct, continue to run the equipment while checking the entering and leaving air in the air handling unit. If these temperatures are in accordance with design conditions, check the operation of the controls and upon completion of this step, the air conditioning system should be in tip-top shape for summer-long operation.

It is important that this "spring tune-up" be carried out as fully as possible. The investment in the air conditioning system is well worth the few hours required to set it in top condition for its job during the hot days ahead. While these suggestions are necessarily general, they cover the majority of installations and their form should lend them to easy modification to fit your particular installation.



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Davis, Dunlap & Carver, Philadelphia

ENGINEERS
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This new consolidated high school replaces nine outmoded rural schools—one of the finest and largest in the East—opened last September with 1340 students. As in so many other educational, industrial, commercial and institutional buildings, adequate ventilation at low cost is assured by the use of Clarage fan equipment.

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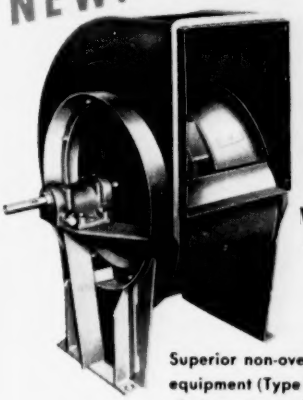
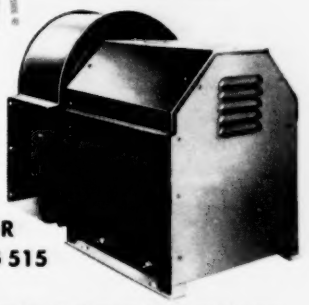
NEW!



WRITE FOR CATALOG 221

Superior non-overloading fan equipment (Type NH) for ventilation, air conditioning and industrial air handling. 23 sizes—from 2,000 to 65,000 c.f.m.

NEW!



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Ready Units for installation in or out-of-doors—complete with motor and V-belt drive. 18 sizes with capacities to 12,000 c.f.m. Cut shows unit equipped with outdoor covers.

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CLARAGE

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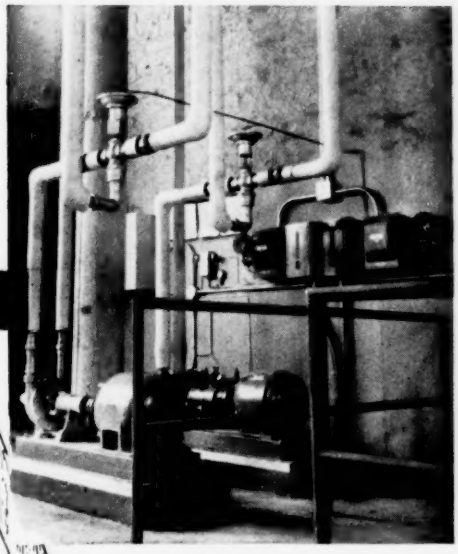
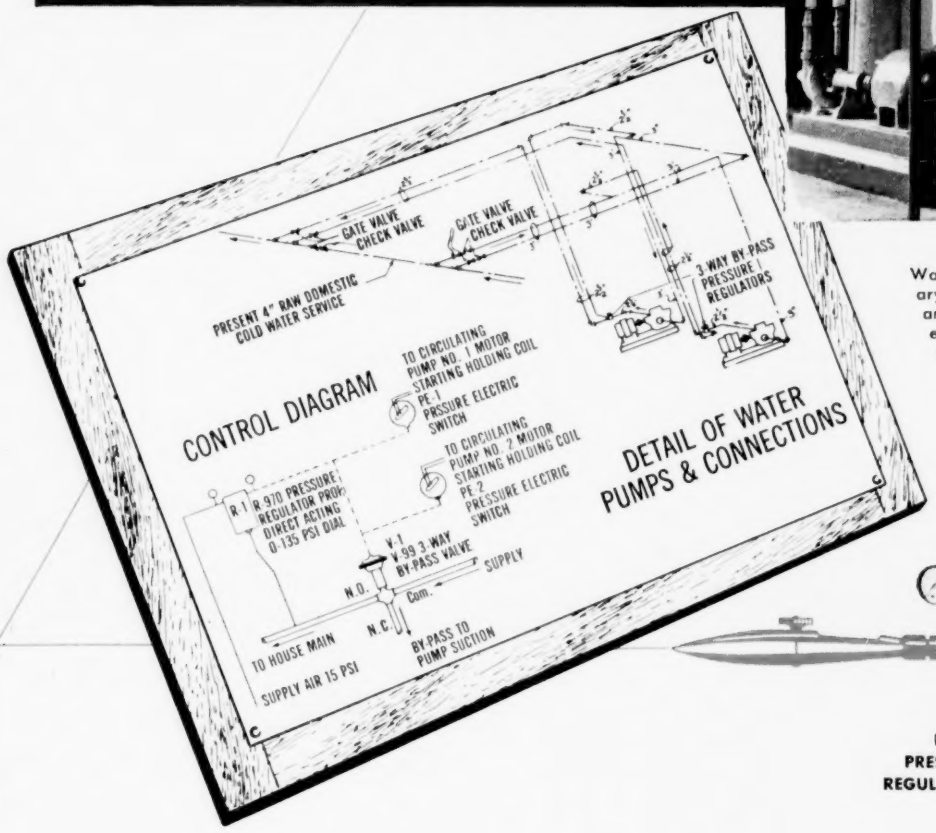
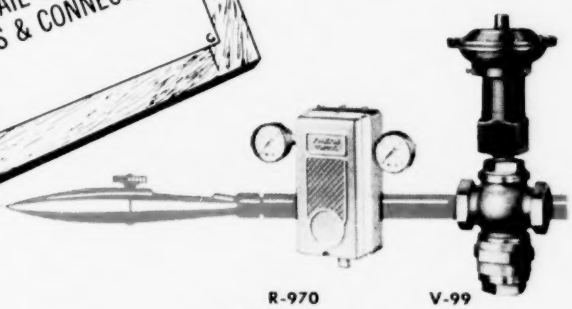
WATER PRESSURE PROBLEM



Water Pump Installation, Marillac Seminary, Normandy, Mo. Maguolo & Quick, architects; Harry F. Wilson, mechanical engineer; McNamara Equipment Co., mechanical contractors, all of St. Louis.





R-970 PRESSURE REGULATOR

V-99 3-WAY BY-PASS VALVE

Eliminate inefficient operation and the possibility of complete shut-downs due to low water pressure! The Johnson Control hook-up, shown here, solves the problems.

Here's how it works: Whenever the pressure of the water in the "house main" falls below the desired point, the Johnson R-970 Pressure Regulator starts the booster pumps, in a predetermined sequence, and regulates the Johnson V-99 3-way By-Pass Valves so that the desired pressure is maintained.

The booster pumps automatically "come to the rescue" only when needed. There is no chance that low water pressure will be overlooked. Another problem solved by Johnson Control.

Send for bulletins describing this, and other, Johnson apparatus. Better yet, ask a Johnson engineer from a nearby Branch Office to call and discuss *your* automatic control problems. There is no obligation, of course. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

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